VOLUME 17 / NUMBER 7
APRIL 8, 1979
ACC. NOS. N79-15898 TO N79-16794

STAR
AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

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Scientific and Technical Aerospace Reports, Volume 17, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1981.

US ISSN 0036-8741

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 919
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 919
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 923

89 ASTRONOMY 923
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 924
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 924
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 928
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 929
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 929

Note: N.A. means that no abstracts were assigned to this category for this issue.

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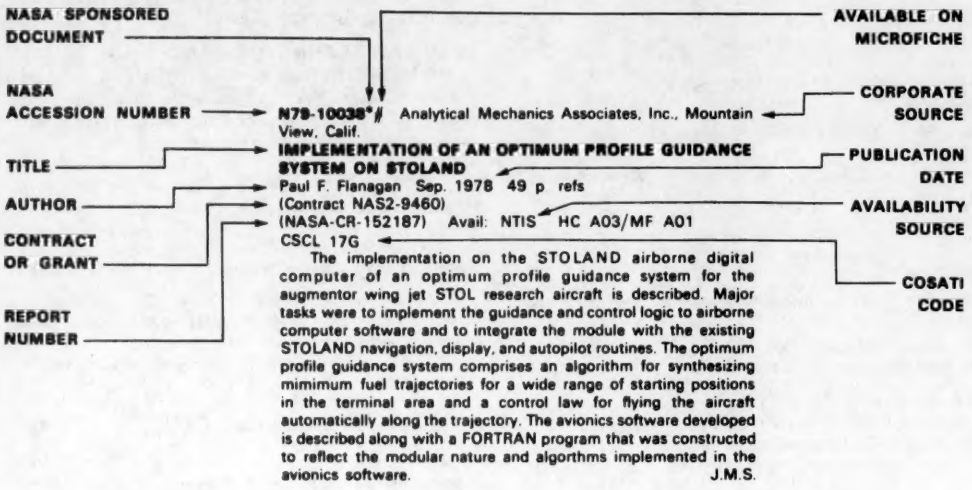
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N79-10038*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
CORPORATE SOURCE
TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
PUBLICATION DATE
AUTHOR
Paul F. Flanagan Sep. 1978 49 p refs
CONTRACT OR GRANT
(Contract NAS2-9460)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-152187) Avail: NTIS HC A03/MF A01
CSCL 17G
COSATI CODE
The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software.
J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects— not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, ALTERNATE AIRCRAFT TAKEOFF SYSTEM (AATS) APPLICATION TO FUTURE FIGHTER AIRCRAFT
B.F. Bauman, Rockwell International Corp., *International Airport, Los Angeles, California* (DF138920; F33615-78-C-3405)

This effort is in support of research and development goals aimed at improving the readiness of future Air Force fighter aircraft to rapidly respond to mission requirements. It is part of a program to develop alternate aircraft takeoff system (AATS) technology for the rapid launch of aircraft from bomb-damaged airfields. Presently, enemy-inflicted damage to paved runways can prohibit the necessary launch of aircraft to accomplish critical wartime missions. This effort is aimed at establishing the design requirements for and determining the potential significant weight and cost savings possible by AATS launch of future fighters. AATS will provide Air Force aircraft with needed ability to carry out wartime missions even when the enemy has damaged existing airfields.

Designs will be prepared for future fighters using AATS launch, VTOL, and 400-, 600-, and 800-foot takeoff distances. The AATS launch design will be used to establish AATS design requirements. The designs will be compared to determine AATS weight, cost and performance advantages over other launch methods.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0002, ADVANCED REPAIR TECHNIQUES FOR LOWER COST
D.E. Parker, Rockwell International Corp., *International Airport, Los Angeles, California* (DF141300; F33615-78-C-3208)

An important element of the overall maintenance and repair of a weapon system is the refurbishment and/or repair of structural components. Frequently, excessive costs arise due to either basic structural design deficiencies or inadequate/outmoded repair methods. The objective of this effort is to devise innovative structural concepts and repair/maintenance techniques for selected high-cost maintenance items to decrease both frequency of repair and cost.

Specific critical airframe and ground support equipment maintenance items from fighter, cargo/tanker, or bomber aircraft will be selected for development of improved designs and/or repair techniques. The lower-cost potential of these techniques will be demonstrated through prototype applications and the approach will be documented for possible AFLC implementation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, DETERMINATION OF MOISTURE CONTENT IN COMPOSITES BY DIELECTRIC MEASUREMENT
L. Hammond, Lockheed Georgia Co., *86 S. Cobb Dr., Marietta, Georgia* 30060 (DF142160; F33615-78-C-3216)

This work effort supports aircraft structural integrity requirements of MIL-STD-1530A. Since absorbed moisture in composite structures degrades matrix-dominated properties, it is important to know the amount of moisture absorbed in service if overly conservative designs are to be avoided. The objective of this work is to evaluate a unique moisture content sensor based on correlation of dielectric property changes with absorbed moisture content. Development and validation of the moisture content sensor will lead to lower cost, safer and more reliable composite aircraft structures.

Composite specimens with embedded capacitance sensors will be fabricated. They will be moisture conditioned. Sensor readings will be correlated with moisture content.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0004, EVALUATION OF AIRCRAFT SEPARATION ASSURANCE CONCEPTS, DISPLAYS AND AVIONICS EQUIPMENT
Unknown, Arnic Research Corporation, *Annapolis, Maryland* 21401 (FA78WA-4091; FA161204 (TRAIS NO.))

The contractor shall furnish all of the personnel, materials, services, equipment and facilities for evaluation of pilot performance and commercial aircraft operation when operating with Aircraft Separation Assurance (ASA) avionics, This program will be structured in two parts: (1) simulation; and (2) preparation for operational testing.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0005, AVIATION AUTOMATED WEATHER OBSERVATION SYSTEM
Unknown, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., *Silver Spring, Maryland* 20910 (FA73WAI-394; FA161178 (TRAIS NO.))

Joint FAA/NOAA NWS Program for the design, development, test and evaluation of an Aviation Automated Weather Observation System (AV-AWOS).

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0006, DEVELOPMENT OF AN AUTOMATED LOW-COST WEATHER OBSERVATION SYSTEM (ALWOS)
Unknown, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, *8060 13th St., Silver Spring, Maryland* 20910 (FA78WAI-872; FA161285 (TRAIS NO.))

The NWS shall furnish or cause to be furnished all necessary qualified professional, technical and administrative personnel, and facilities and equipment, including the necessary instrumentation and test equipment, to accomplish the work defined in FAA engineering requirement, Development of an Automated Low-Cost Weather Observation System. Additional engineering requirements may be added to this agreement by amendment.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0007, AIRPORT PAVEMENT PERFORMANCE ANALYSIS

Unknown, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (FA78WAI-846; FA161217 (TRAIS NO.))

The purpose of this effort is to develop, demonstrate, and revise as needed, a system of condition data collection for civil airport pavements. Within this framework, two specific objectives are as follows: a. Develop a procedure based on the current state-of-the-art that will provide for analysis of the present condition of a pavement, and will compare this condition with that anticipated at time of design; and b. Validate the procedure at civil airports to assure the practicality of the methodology.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0008, MICROWAVE LANDING SYSTEM (MLS) TEST AND EVALUATION

Unknown, U.S. Dept. of Defense, Army, *Fort Monmouth, Red Bank, New Jersey* 07703 (FA76WAI-672; FA059974 (TRAIS NO.))

Provide a means for equipment loan and transfer of accountability from the FAA to the Army during the joint civil/military Microwave Landing System (MLS) test and evaluation activity. This activity will take place at selected facilities with the primary test sites being FAA NAFEC, Pomono, New Jersey, and NASA-Ames Testing and Tracking Facility at Crows Landing, California.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0009, NOISE MEASUREMENTS OF THE CONCORDE AT JFK INTERNATIONAL AIRPORT

S. Slutsky, Polytechnic Inst. of New York, Brooklyn Campus, School of Science & Engineering, Dept. of Aerospace Engin & Applied Mech, *333 Jay St., Brooklyn, New York* 11201 (177840 (HRB NO.))

The Polytechnic is providing the field labor and other inputs as called upon. Data is being collected at up to seven fixed locations. Data will be collected at other locations if deemed necessary by FAA.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0010, DURABILITY METHODS DEVELOPMENT

J.W. Morrow, General Dynamics Corp., *P.O. Box 748, Fort Worth, Texas* 76101 (DF140660; F33615-77-C-3123)

Current Air Force structural integrity policy requires that an Air Force airframe shall be designed such that the economic life is greater than the design service life when subjected to the design service loads/environment spectra. This is necessary to minimize cracking or other structural or material degradation which could result in excessive maintenance or functional problems. Compliance with this policy requires the ability to predict the economic life of an airframe. The objective of this program is to develop and verify the durability methodology necessary to predict the economic life of advanced structures. The results will be used to design more durable military aircraft structures.

Durability methods shall be developed based on a crack growth damage accumulation approach using an equivalent initial quality concept and a statistical approach employing a reliability-based model. The most promising of these methods will be evaluated and verified using quantitative structural cracking data obtained from high-time service structures or full-scale test articles. The results will be documented in the form of a durability design handbook.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0011, HT PP 78-10 INVESTIGATION OF CANDIDATE THRUST PRODUCING SYSTEMS FOR FUTURE ARMY AIRCRAFT

J. Gomez, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3813)

To define advanced thrust producing systems which may provide significant helicopter and fixed wing aircraft improvements in order to identify future research.

1. Review and summarize past thrustor concepts including advantages and disadvantages of each. 2. Review future Army aircraft requirements and their related mission requirements. 3. Identify thrustor systems with potential to accomplish required missions. 4. Define scope of work required for each thrust device.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0012, DEVELOP METHODS FOR RESTORING AVIATION FUEL AMK MODIFIED BY ANTIMISTING POLYMER ADDITIVES

Unknown, U.S. Dept. of Defense, Army, Mobility Equipment Research & Development Command, *Fort Belvoir, Virginia* 22060 (FA78WAI-880; FA161225 (TRAIS NO.))

Develop a suitable method for restoring filtration, atomization and other essential properties to FM-9 antimisting fuel for use in aircraft turbine engines and fuel systems. Task I - Investigate, develop and measure FM-9 fuel restoration. Task II - Demonstrate effectiveness of degraders. Task III - Analysis and recommendations.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0013, MULTI AIRCRAFT TACTICAL EVALUATION PROGRAM

D.S. Hague, Aerophysics Research Corp., *Bellevue, Washington* (DF137350; F33615-78-C-3000)

This effort supports analysis efforts in air-to-air combat which contribute to air superiority missions. Current air combat evaluation methods for multiple aircraft engagements and advanced technology vehicles are almost totally lacking. Hence, the inability to analyze such engagements makes it difficult to assess how new concepts or tactics contribute to the above mission. The goal of this effort is to develop the needed methodology to analyze advanced technology aircraft and tactics in multiple vehicle air-to-air engagements. This work will provide a tool for tacticians to use in determining the effectiveness of new concepts and tactics and result in improved capability to perform air-to-air functions for the Air Force.

Work is to mathematically model the physical air-to-air engagement of multi-vehicles including development of optimal or suboptimal control strategies. The model developed is to incorporate the ability to handle conventional as well as unconventional aircraft capabilities such as direct force control and thrust vectoring/reversing in a realistic environment. Conventional and advanced weaponry is to be modeled including long-range missiles, maneuverable missiles, steerable guns, and laser weaponry. All facets of military mission operation are to be considered with appropriate measures of merit to determine payoffs for advanced technology and tactics for multi-vehicle engagements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0014, NAVY VEHICLE DESIGN AND CONSTRUCTION - AERODYNAMIC CHARACTERISTICS OF WINGS WITH SEPARATED FLOW

B. Maskew, Analytical Methods Inc., *110 116th Ave. S.E., Bellevue, Washington* 98004 (DN875208; N00014-78-C-0128)

The maneuvering capability of modern fighter aircraft is most often limited by heavy buffet and/or loss of control, both due to flow separation on the aircraft wings. Consequently, the consideration of flow separation in the design and analysis of wings is extremely important. Unfortunately, the exact theoretical

computation of these complex flow fields does not appear possible in the foreseeable future. Current linear flow models are not applicable for separated flows. In addition, wind-tunnel tests are extremely expensive and often come too late in the design cycle to impact major aerodynamic/structural design tradeoffs. It is the objective of this research to develop an approximate numerical model of the flow on three-dimensional wings that will permit computation of the aerodynamic characteristics including the effects of flow separation.

An approximate viscous flow method will be developed to predict areas of separation on the wings. The separated flow region and resulting wake will be modeled using a potential flow code. An iterative procedure will be used to model the viscous/inviscid flow interaction. The basic procedure has already been used very successfully for two-dimensional flows on airfoils.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0015, TRANSONIC UNSTEADY AERODYNAMICS FOR AEROELASTIC APPLICATIONS
H.K. Yoshihara, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF133090; F33615-78-C-3201)

This work unit supports the prediction of time-dependent loads, flutter, stability and control for flexible aircraft in transonic flight. At present, there are no analytical methods available which can be used in aircraft design, and reliance must be placed on proof-tests of extremely expensive aeroelastic wind tunnel models which yield very limited data. The objective of this effort is to improve the accuracy and realism of the design of flexible aircraft which fly in or through the transonic region. These improvements will also improve the cost and efficiency of the aircraft design process and improve flight safety.

A contractor will evaluate the aerodynamic equations for time-dependent flow over aircraft at transonic speeds. He will write computer programs to solve those equations by relaxation techniques and by time-integration techniques. The final phase will be the application of the programs to a large-scale aircraft aeroelastic design problem.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, MOLECULAR MECHANICS OF CHEMICAL REACTIONS
D.R. Herschbach, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Chemistry, *Cambridge Station, Cambridge, Massachusetts* 02138 (CHE76-12274 A02)

A three-year program of experimental and theoretical studies of the dynamics of simple chemical reactions, inelastic energy transfer, and 'quasi-liquid' interaction is planned. The major experimental projects include: (1) reactions and inelastic scattering of van der Waals molecules; (2) analysis of angular momentum disposal by means of laser-induced fluorescence; (3) solvation of solute molecules in small solvent clusters probed by laser-induced fluorescence; (4) an attempt to produce beams of solvated electrons and to measure the electron affinity of small clusters of water and ammonia molecules in collisions with hyperthermal alkali atom beams; (5) study of reactions and diffusion processes on coated surfaces, including vibrational excitation of incident molecules, stimulated surface ionization, and stimulation of membrane systems. Theoretical studies include several approaches to the analysis or prediction of vector properties of reactions, particularly by means of classical trajectory calculations, impulsive and statistical models and information theory methods. Also planned is a large-scale electronic structure calculation to obtain an accurate potential energy surface for bond exchange among three hydrogen molecules. This work is a continuation of that currently supported by Foundation grant MPS7102601 (GP-27622X).

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0002, THEORY OF HIGH-ENERGY ION-ATOM AND ATOM-ATOM COLLISIONS
J.S. Dahler, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Chemical Engin, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (CHE76-11037 A02)

This research involves the development and testing of efficient theoretical procedures for estimating the cross section (both differential and total) for a variety of the excitation and quenching processes that take place in high-energy (approximately 1-200 keV) ion-atom and atom-atom collisions. Among the many systems to be considered are alkaline earth ion-rare gas and alkali metal-rare gas pairs, e.g., Be ion, Mg ion,.../He,... Ne,... and Li, Na,.../He, Ne...Xe. The processes of interest include excitation and quenching of the projectile alkaline earth ions and alkali atoms, excitation of the target rare gas, charge exchange, and electron detachment. The plan involves the systematic investigation of a variety of scattering theory approximations including solution of the close coupled equations of the impact parameter method and Born and distorted wave Born approximations. Great emphasis is placed upon the testing and evaluation of different models for the electronic Hamiltonian operator or, more specifically, of the pseudo-potentials which are used (either explicitly or implicitly) to represent interactions of the electrons with the many-electron 'cores' of the projectile and target species.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0003, THERMAL STABILITY OF HYDROCARBON FUELS
C.J. Nowack, U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center, Fuels Lubes & Power Dr Sys Gp, *Trenton, New Jersey* 08628 (DN889801)

To determine the relationship between fuel properties and thermal stability of synthetic and petroleum jet fuels.

Perform thermal degradation tests of fuel samples with controlled chemical composition using the jet fuel specification test procedure as well as actual aircraft hardware. Correlate the stability of the fuels with the chemical composition.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

3.0004, MOLECULAR BEAM AND LASER-INDUCED FLUORESCENCE SPECTROSCOPY OF SMALL MOLECULES
J.S. Muenter, University of Rochester, School of Arts & Sciences, Dept. of Chemistry, *260 Crittenden Blvd., Rochester, New York* 14627 (CHE77-12527 A01)

Using the techniques of molecular beam electric resonance spectroscopy and laser-induced fluorescence spectroscopy, Prof. Muenter will study electronic properties of a variety of small molecules. The molecular beam methods will be used to accurately measure dipole moments, polarizabilities, and nuclear hyperfine parameters of the ground electronic state of molecules. The molecules which will be studied have been chosen because of unusual chemical characteristics and in general contain fluorine, chlorine, and/or nitrogen atoms. A major goal in these studies will be obtaining information which better defines the intermolecular interactions of the molecules in question.

The laser-induced fluorescence experiments will be directed toward extending high-resolution measurements, which have been routine for the electronic ground state of molecules, to excited electronic states. Wavelength tunable dye lasers will be used to excite molecules to upper electronic levels where radio frequency and microwave transitions will be studied. The high-resolution transitions will be detected by observing the excited electronic state fluorescence. The molecular properties obtained in these experiments will provide important parameters which characterize photochemically active molecules. This research represents a continuation of that currently supported by Foundation grant CHE-7412250.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0005, PARTIAL-WAVE METHODS IN MOLECULAR ELECTRONIC STRUCTURE CALCULATIONS
E.A. McCullough, Utah Higher Education System, Utah State University, School of Science, Dept. of Chemistry & Biochemistry, *Main Bldg., Office 104, Logan, Utah* 84321 (CHE76-08768 A01)

One goal of research in quantum chemistry is the quantitative prediction of molecular properties. In light of contemporary scientific problems involving molecules in the upper atmosphere or interstellar space, this goal increases greatly in importance, for the molecular species found in these environments are difficult to study by experimental methods. Hence, theory can and must make significant contributions in these areas. Despite recent advances in molecular quantum mechanics, there remains a group of molecular properties which are difficult to compute accurately. This is because most of the current techniques rely on a single computational method which is not well suited to the description of these properties. Professor McCullough has developed a different method involving partial-wave expansions and numerical orbitals. He has demonstrated that the method enables superior predictions of molecular polarizabilities and cusp ratios of wavefunctions, and has used this capability to determine how best to choose a basis set for calculating a specific molecular property in the traditional computational method. He will extend these studies to the study of negative ions and excited states of diatomic molecules and to higher-order electric and magnetic field related properties.

This research is a continuation of that supported under NSF grant CHE-7608768.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, ENGINEERING SPECIALIZED RESEARCH EQUIPMENT - BITUMINOUS MATERIALS TESTING EQUIPMENT
R.K. Moore, Auburn University, School of Engineering, Dept. of Civil Engin, *Auburn, Alabama* 36830 (ENG78-10397)

This grant provides funds for the acquisition of specialized equipment for basic research in bituminous materials in civil engineering. The equipment to be acquired consists of a stabilometer, a cohesiometer, a gyratory-shear compactor, and a sample extruder.

The equipment will augment a developing research effort to synthesize mixture and structural design procedures for bituminous emulsion/soil/aggregate mixtures used in highway and airfield pavement systems. Design procedures for bituminous emulsion-treated materials have not been standardized and this deters the utilization of emulsions as substitutes for the more energy intensive asphaltic cements and asphaltic cutbacks.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0002, REFURBISHMENT AND ENGINEERING SUPPORT OF RECOVERED PAYLOAD RECOVERY SYSTEMS
E. Allen, Space Data Corp., *Tempe, Arizona* (DF249840; F19628-78-C-0015)

AF function - recovery of aerospace payloads. Deficiency - economical recovery of small diameter sounding rocket payloads. Objective - to provide the AF with reliable, accurate, and low-cost recovery systems for small sounding rocket payloads. How research contributes - will result in an inventory of reliable recovery systems that will enable scientific payloads to be recovered, refurbished and reflown, thereby reducing the per mission cost of sounding rocket research projects.

The AF intends to contract for the refurbishment of recovered, recovery systems. It is intended that four GFE systems per year will require refurbishment in each of three years.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0003, RESEARCH STUDY ON ELECTRONIC COMPONENTS AND MATERIALS FOR AIRBORNE PLATFORMS
R.F. Potter, (No Performing Organization Reported), San Diego 92106, *California* (DN890059; N00019-78-M-0098)

A research study to establish appropriate research areas for developing electronic components and materials to be used in naval airborne platforms of the future.

A report on the result of this study will be completed approximately May, 1978.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0004, ENGINEERING SERVICES
J. Labuda, Aerojet Liquid Rocket Co., *P.O. Box 13222, Sacramento, California* 95813 (DF582230; F19628-77-C-0182)

Objective - the goal of the contract effort is to provide launch vehicle services, analytical services and an attitude control system (ACS) to maintain specific pointing angles of a sounding rocket payload.

The contractor provides launch support as required at White Sands Missile Range, the engineering analytical support at the plant in Sacramento, California as directed. The ACS technical support personnel is based at the plant and will provide engineering, air bearing testing integration with the payload, and field services for the ACS at WSMR.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0005, EVALUATION OF DATA ON VISCID-INVISCID INTERACTIONS IN TURBULENT FLOW
S.J. Kline, Stanford University, School of Engineering, Dept. of Mech Engin, *Stanford, California* 94305 (DF052920; AFOSR-78-3659)

AF function - advanced propulsion and aerospace vehicle systems. Opportunity - assessment of computational methods for viscid-inviscid flow fields. Objective - to collect, classify and assess data available for turbulent flow fields. How work contributes - will provide a basis for determining range and reliability of different computational methods developed for turbulent shear flows.

The first task will be the collection of data sets. Then it will be assessed for significance, accuracy, and reliability. The data will be grouped into several related classifications in order to organize the topic and to relate data, computer models, and applications. Points to consider will include degree of flow complexity, flow types, and related applications.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0006, PARACHUTE REPACK INTERVAL EXTENSION STUDY
T.J. Bozack, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN695431)

Provide data on the effect on parachute system performance nad material strength which would result from extending the parachute repack interval beyond the present limit of 217 days. Goal: extend the maximum parachute repack interval to 36 months.

For manual bailout parachute systems an analysis of factors effecting parachute performance or reliability effected by repack cycle time will be conducted using data from in-service experience obtained through the maintenance and material management (3M) system, the Computerized Unsatisfactory Report Engineering System (CURES), and direct contact with in-service units. Based on these data, the repack interval will be increased incrementally toward a final goal of 36 months. For

escape system parachutes, initial emphasis will be placed on the Martin-Baker NES-8 and NES-14 parachute assemblies (the largest group of Navy escape system parachutes). (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0007, PARACHUTE CONTAINER CLOSURE - NEW TECHNOLOGY

D. Goodrich, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN895420)

Provide an improved parachute container closure device, suitable for aircrew emergency escape equipment, in increasingly higher performance environments.

Design and demonstrate prototype closure concepts suitable for incorporation in both emerging and future parachute container configurations. (A) Innovative materials and fabrication techniques such as low-friction plastics and permanent impregnation of metal parts with lubricant will be identified and utilized as appropriate. (B) Mechanical elements such as force multipliers, or ball and detent locks will be considered as a means of accommodating a high shear force on the closure without the penalty of an excessive actuation force. (C) Invite industry participation to devise prototypes or production versions, evaluate candidate designs using laboratory and flight tests. Document results and prepare design specifications.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0008, GAS DYNAMICAL ISOTOPE SEPARATION IN THE OPPOSED JET CONFIGURATION

F.C. Hurlbut, University of California, Berkeley Campus, School of Engineering, Dept. of Mech Engin, *Berkeley, California* 94720 (ENG76-17189 A01)

This action will provide an additional year of support for NSF grant ENG 76-17189.

The objective of this project is to conduct fundamental studies of processes in binary and ternary gas mixtures in curved flows created by the interaction of opposed jets. A dominant feature of these flows will be the strong pressure gradients resulting from centripetal accelerations. Measurements will be made of the species-dependent density and flow velocity distributions within the interaction region. This region will be established by opposing jets in the test section of the low-density wind tunnel.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0009, AIRBORNE X-BAND DOPPLER

B.L. Trotter, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (RG120255)

PROJECT OBJECTIVE: To determine the problems involved in designing, installing and utilizing a pulse dopplar radar and its data processing systems when installed on the WP3D aircraft.

CURRENT YEAR PLAN: Writing a report detailing the problem results and recommendations for further development.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

4.0010, AN EXPERIMENTAL AND ANALYTICAL STUDY OF BOUNDARY LAYERS IN HIGHLY TURBULENT FREE-STREAMS

R.P. Dring, United Technologies Corp., Research Laboratories, *400 Main St., East Hartford, Connecticut* 06108 (DF052270; F49620-78-C-0064)

AF function - advanced turbomachinery. Opportunity - improvement of present methods for predicting heat transfer and aerodynamics losses on cooled gas turbine blades. Objective - determine the influence of free-stream turbulence level on the heat transfer and profile development of 1) two-dimensional, fully turbulent, zero pressure gradient boundary layers and 2) two-dimensional, accelerating transitional boundary layers. How work contributes - will provide data to modify current turbine airfoil aerodynamic and cooling design systems so they will more accurately account for the entrainment of free stream turbulence energy into boundary layers and for the combined effects of acceleration and free stream turbulence on the boundary layer transition process.

An experimental program will be performed and data obtained for fully documented boundary layer flow for various turbulence levels and free stream velocities. Following this, similar data will be obtained for transitional boundary layer flow. The data obtained will then be compared to the predictions obtained from the UTRC finite-difference boundary layer calculation method.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0011, HIGH-TEMPERATURE ELECTRONICS TECHNOLOGY

J.E. Davey, U.S. Dept. of Defense, Navy, Naval Research Lab., *Washington, District of Columbia* 20375 (DN880152)

To investigate device and integrated circuit performance as related to direct utilization in naval aircraft engine control functions at ambient temperatures up to 300 deg. C. The program will integrate existing high-temperature performance data with that obtained from representative members of the full family of devices and circuits required for engine control at 300 deg c. Reliability and performance limiting factors are to be determined. The full program is to include all promising high-temperature semiconducting materials.

This effort is considered to be integral to a long-range NAVAIR program on improved devices and related technology pertaining to naval aircraft requirements. As such, it is expected that initial phases will be expanded as progress and more advanced requirements warrant. Initially the program will investigate silicon devices and integrated circuits for the high-temperature application; performance and reliability factors will be determined. A second year follow-on and parallel phase will examine GaAs devices and integrated circuits with the same emphasis. An additional program may be also initiated to examine the fundamental limitiations of these and other contender materials.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0012, NEUTRINO APPLICATIONS

A.W. Saenz, U.S. Dept. of Defense, Navy, Naval Research Lab., *Washington, District of Columbia* 20375 (DN880051)

The objective is to determine the feasibility of neutrino communication over global distances, point-to-point, directly through the earth.

The work requires the use of state-of-the-art theoretical methods of high energy and nuclear physics, acoustics, and communication engineering.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0013, TEST PROCEDURES FOR SEMICONDUCTOR RANDOM ACCESS MEMORIES

S.M. Reddy, University of Iowa, School of Engineering, Dept. of Electrical Engin, *Jessup Hall, Iowa City, Iowa* 52240 (DF052050; AFOSR-78-3582)

AF function - to advance the design of digital avionics systems. Important functions in growing numbers are being performed by digital computers on USAF aircraft. Deficiency - the large size random access memories that are now being fabricated on a single chip are impossible to test completely and a methodology is required that will enable digital circuit engineers to test and maintain computers by using extremely efficient partial testing patterns. Objective - to design test procedures to cover individual failure modes, which would be used sequentially. These procedures are to be applicable to all random access memories. How work contributes - the results of this research, if successful, would advance the reliability of on-board computers which are essential for future aerospace vehicles.

The plan is to study the interactions between faults, analyze the fault coverage provided by given test patterns, derive bounds on the length of test patterns that detect a given class of faults, and design test patterns that are better than known test patterns that yield equal or less fault coverage.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0014, ARCTIC DIGITAL SOUNDING

K. Bibl, University of Lowell, School of Pure & Applied Sciences, Dept. of Physics & Applied Physics, *Lowell, Massachusetts* 01854 (DF580560; F19628-78-C-0085)

AF function - communications and detection. Deficiency - prediction and real-time specification of the arctic ionosphere. Objective -develop capability for automatic identification of o and x modes in ionograms, develop capability for coarse angle of arrival measurements during ionosoundings and conduct drift experiments to support auroral studies. Develop algorithms for the automatic reduction of selected ionospheric parameters from digital ionograms. Assess feasibility of a hardware system to automatically read these parameters. How research contributes - automatic real time mode identification using polarized receive antennas and the inherent capability of digisonde for amplitude discrimination will improve present manual and planned automatic data reduction in support of AFGWC. Subsequent drift experiments will support a study of the development of the mid-latitude f-layer trough, supporting OTH-related efforts. The contractual efforts also provide technical support and consultation on complex digital systems. The Goose Bay ionospheric data are essential in the laboratory's research efforts in providing HF systems a model of the arctic ionosphere. Automatic real-time reduction will result in considerable cost savings and decrease response time of the environmental data acquisition.

An antenna switch controlled by the digisonde will be constructed to select sequentially left or right handed circular polarization of the receive antenna system during ionogram sweeps. The digisonde automatically lables echoes by amplitude comparison as o or x components. Steering of the receive antenna beam will permit coarse angle of arrival determination of all returns to facilitate identification and clarification of oblique echoes. The digisonde will further be used to conduct drift experiments interspersed in routine ionogram recording during ground-based/airborne f-layer trough studies. Automatic processing of digital arctic ionograms will be advanced through the development of automatic scaling algorithms and the assessment of the technical feasibility of a hardware solution. Selected groups of digital ionograms will be analyzed in support of arctic studies. Hourly ionograms will be evaluated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

4.0015, ELECTRICAL COMPENSATION IN INP

B.L. Mattes, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Electrical & Computer Engin, *Ann Arbor, Michigan* 48104 (DN890095; N00019-78-C-0406)

Conduct a research study on electrical compensation in indium phosphide (InP) produced by background impurities and structural defects.

The approach will be to study impurity background compensation by growing a series of InP liquid phase epitaxial layers in several growth systems (e.g., SiO2:C:H2; SiO2:BN:H2; SiO2:NB:Ar) at different bakeout temperatures with periodic bakeouts between each growth. The initial objective will be to determine the cause and effect of C impurity contamination in the InP epitaxial layers. In the structural area the initial work will be to examine the substrate and growth surfaces and the substrate-layer interface.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0016, FAR INFRARED MERCURY-CADMIUM TELLURIDE PHOTOCONDUCTIVE DETECTORS

C.J. Summers, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF052420; F49620-78-C-0072)

AF function - secure space communication and covert optical electronics require devices which exploit the properties and interaction effects of materials with far infrared radiation. Opportunity - infrared materials research has a high potential impact on novel detectors, sources and communications for airborne and spaceborne applications. Objective - the objective is to improve current-detector performance by more than an order of magnitude at long wavelengths by utilizing the effect of moderate magnetic fields on increasing the lifetime of photoexcited excess-electrons in hgcdte alloys at low temperatures. A systematic study of the far-infrared photoconductive lifetime in HgCdTe as a function of alloy composition, charge-carrier concentration, temperature, and magnetic-field strength is being undertaken to quantitatively establish the role of magnetic fields in enhancing long-wavelength characteristics of HgCdTe detectors and to identify the responsible physical mechanisms. Electron and crystal-lattice interactions that are independent of magnetic fields but which limit photoconductive lifetimes at long wavelengths will also be investigated. Calculations will be made of the magnetically enhanced performance of HgCdTe detector configurations and of the long-wavelength limits for detector operation. How work contributes - it is expected that this work will lead to the development of high-performance (magnetically enhanced) photoconductive detectors for 15-50 micrometer radiation. Performance enhancement at long wavelengths is anticipated also for line and square detector-arrays for sensitive targeting operations in space, where a distant, relatively-cold object must be sighted and tracked against a space or terrestrial background.

Photoconductor-grade, n-type, single-crystalline, HgCdTe specimens selected on the basis of crystalline quality and compositional homogeneity, with ranges of alloy compositions and conduction-electron concentrations will be electrically and optically characterized. Photo-Hall-bar elements will be fabricated, and their photoconductive properties, including lifetime, will be measured for 5-300 k temperatures under controlled background conditions. Magnetophotoconductivity measurements will be made on specimens for which the electron lifetime is limited by auger recombination. Selection rules will be investigated by performing Faraday and Voigt measurements. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0017, SOLID ROCKET MOTOR IMPACT RESPONSE STUDIES

D.C. Bickel, U.S. Dept. of Energy, *Albuquerque, New Mexico* 87115 (DF188770)

The objective is to provide experimental data on the impact response of solid propellant rocket motors (SRM). More specifically, this work will provide data on the stress/strain history of an SRM after impact and measurements of the analytically nonconducive fracture/fragmentation problem. The data is to provide an experimental data base for safety engineering studies related to the nuclear safety evaluations of current and future DOD orbital/deep space missions through the STS time frame.

Impact tests at varied impact velocities and orientations will be conducted at Sandia Laboratories, Albuquerque. Impacting mediums will include (1) unconstrained solid propellant, (2) scale model SRM's and (3) full-scale segments of SRM. Full instrumentation and photographic coverage will be provided.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0018, 400 TO 600 KNOT EJECTION PROTECTION

T. Thommasson, Stencel Aero Engineering Corp., *Asheville, North Carolina* (DN881496; N62269-77-R-0251)

Investigate and develop systems and or techniques to provide personnel protection from aerodynamic forces in the 400 to 600 knot speed range. This contract supports work unit ZA601, Agency Accession No 681080.

Investigate the requirements for high g ejection escape. Define aerodynamic and deceleration forces developed on the man seat recovery system and their effects upon the escape and suvivability of the aviator. Develop equipment for maximizing high g survivability without impairment of low-speed escape performance.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0019, DEVELOPMENT OF THERMAL AND FLOW MEASUREMENT TECHNIQUES

D.M. Parobek, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF142430)

Advanced reentry, interceptor, and maneuverable military flight vehicles operate at speeds which lead to problems with aerodynamic heating. This has generated the requirement to measure the surface heating rate to test models of these vehicles and certain thermodynamic parameters of the flow fields surrounding these vehicles. The objective of this work unit is to develop the instrumentation required to make these measurements.

Specialized measurement instrumentation will be developed in-house with contract assistance as required. Extensive tests on new sensors, probes, struts, and various other measurement instruments such as infrared detectors and scanners will be conducted in the thermal lab and test facilities. Work units 14260116, 14260120, 14260134, 14260135 and 14260213 are in process of termination and the remaining work of these will be consolidated under this new work unit.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0020, FINITE-ELEMENT ANALYSIS OF THREE-DIMENSIONAL VISCOUS-INVISCID INTERACTING FLOWS ABOUT AUGMENTOR AIRFOILS

A.J. Baker, Computational Mechanics Consultants Inc., *Knoxville, Tennessee* (DN881477; N62269-77-C-0491)

To develop numerical solution procedures for the prediction and analysis of 3-D flows associated with V/STOL aircraft propulsive systems. Present solution procedures using potential flow techniques have been found to be inadequate. This contract supports work unit NN701, Agency Accession No DN481077.

A parabolic partial differential equation system appropriate for the analysis of 3-D turbulent jet issued from an augumentor wing in cross flow will be established. A finite-element algorithm will be developed for solution of the problem.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0021, UNSTEADY SWIRLING FLOWS IN GAS TURBINES

M. Kurosaka, University of Tennessee, Central Office, Space Inst., *Tullahoma, Tennessee* 37388 (DF051590; F49620-78-C-0045)

AF function - advanced turbomachinery. Opportunity - improve ability to predict aerodynamic forces inside turbomachinery. Objective - acquire fundamental understanding of phenomenon characterized by violent fluctuations occurring in swirling flows inside turbomachinery. How work contributes - will provide explanation for this complex problem and contribute to assuring that adequate design margins are incorporated in future designs.

In the first phase, which covers the first two years, a theoretical investigation will be conducted. The governing parameters shall be identified and the relationship between them determined. Use of both linearized and nonlinear wave theory will be utilized.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0022, THEORETICAL BASIS OF THE FLOW TURNING EFFECT IN COMBUSTION STABILITY

W.K. Vanmoorhem, Utah Higher Education System, University of Utah, School of Engineering, Dept. of Mech & Industrial Engin, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DF052770; AFOSR-78-3645)

AF function - weapons delivery. Deficiency - all developments in rocket technology (tactical or strategic) are subject to at least the possibility of unstable combustion. Objective - this theoretical analysis will improve the basic understanding of the 'flow turning' effect which has been incorporated empirically into the most-used solid propellant combustion instability models. How work contributes-the result of this work should be clarification of assumptions and improved understanding of 'flow turning', as it is presently used in combustion modelling.

The existing theory will be reviewed and reformulated to clearly define assumptions and approximations already made. In a second phase the relationship between one- and three-dimensional problems will be studied. In a third phase, time permitting in this one year program, some simple 'flow turning' models will be investigated and numerical results produced.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, ATMOSPHERIC INTERACTION STUDIES (FIELD AND CHAMBER)

J.F. Meagher, U.S. Tennessee Valley Authority, Div. of Environmental Planning, Air Quality Research Section, *Muscle Shoals, Alabama* 35660 (D8-E721-DL; V625B-38)

The objective of this project is to determine the chemical reactions of plume constitutents from coal-fired power plants. Emphasis is placed on studying the rate of oxidation of SO2; NO-NOx chemistry is also under investigation. The goal is to predict the concentrations of major constituents at various locations downwind. Highly instrumented aircraft measure the concentrations of the constituents at several altitudes at each of a number of downwind distances. Pertinent meteorological parameters are measured from the aircraft and on the ground. These data will be utilized to develop a plume chemistry model that will detail the plausible mechanisms and kinetics of chemical reactions occurring in the plume and the meteorological influences on these reactions. Field experiments were conducted in May and June 1978 at TVA's Colbert and Paradise Steam Plants. The purpose of this study was to investigate the effects of boiler type on the conversion of SO2 to sulfate is slow (less than 2% per hour in the plume close to the plants). After approximately 2 hours of drift time, the conversion rate increases to 4 to 5 % per hour. Samples were collected at distances ranging from 7 to 60 km downwind at Paradise. Preliminary results show that the conversion rate is very slow, about 1% per hour, and does not change significantly over the distances sampled. A milestone report on the SOx power plant plume chemistry is being prepared.

Initial characterizaton of the photochemical reaction chamber has begun. Measurements are being made to determine light intensity, temperature, and concentration gradients and to compare the relative oxidation rate of SO2 in this chamber to others presently in use. A report has been prepared on the design of the photochemical reaction chamber. Tentative plans are to move the chamber to the Colbert Steam Plant in January with initial introduction of stack gas into the chamber in March.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Energy Minerals & Industry

5.0002, REMOTE SENSING OF SO2 EFFECTS ON VEGETATION

C.D. Sapp, U.S. Tennessee Valley Authority, Div. of Environmental Planning, Air Quality Research Section, *Muscle Shoals, Alabama* 35660 (D8-E721-DJ; V625C-45)

This research activity involves testing, refinement, and development of remote sensing instrumentation and techniques for monitoring the visible, previsual, and extravisual effects of SO2 emissions from fossil-fueled electric generating stations on terrestrial vegetation. NASA and EPA National Environmental Research Center are collaborating with TVA in the project. Low- and high-altitude color, color infrared, multi-spectral scanning, and ground-truth data are being obtained for effects on soybeans and mixed southern pine-deciduous hardwood timber stands in

the vicinities of the Shawnee, Widows Creek, Johnsonville, and Colbert Steam Plants for both manual and automated interpretations. Spectral reflectance data are being acquired in the field and laboratory to calibrate the aerial sensors.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Energy Minerals & Industry

5.0003, OPTICAL STUDIES OF THE MAGNETOSPHERIC CUSP FROM WEST SPITSBERGEN

C. Deehr, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM77-24838)

Funding under this grant will permit, in cooperation with Scandinavian scientists, a program of optical observations in the magnetospheric cusp region to be carried out from two stations underneath the dayside aurora. The objectives of the program are to obtain morphological observations of the daytime aurora as well as spectra and vertical luminosity profiles of the optical emissions. This will be accomplished by using meridian scanning photometers, all-sky cameras and wavelength scanning spectrometers at Ny Alesund and Longyearbyen on West Spitsbergen which is at a high enough latitude to be dark during the winter day and still be under the moderately disturbed daytime aurora. The purpose of the proposed observations is to document the characteristics of the particle precipitation associated with the magnetospheric cleft and to map the extent of this precipitation during different levels of geomagnetic disturbance, thereby mapping in space and time the extent of the auroral substorm.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0004, AN INTENSITY-CALIBRATED STEREO IMAGING SYSTEM FOR AURORAL RESEARCH

T.J. Hallinan, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM77-01370 A01)

This grant funds research on the aurora using a stereo-imaging television system. Earlier work (see ATM-7600176) has resulted in the development of a television system useful for low-light intensity studies and the identification of a variety of auroral transient and wave phenomena. Work to be done on the current grant has two principal goals: to demonstrate the capability of inferring approximate particle energy distributions from auroral images obtained with an intensity-calibrated stereo television system and to apply the newly developed technique to a few classes of aurora whose morphological characteristics are established. Successful completion of this will yield considerable new quantitative information about the aurora.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0005, A THEORETICAL STUDY OF THE SUBSTORM PROCESSES

J.R. Kan, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (ATM77-11371 A01)

It is generally agreed that the magnetospheric substorm results from an explosive conversion of magnetic energy generated by the interaction between the solar wind and the magnetosphere. The substorm triggering process responsible for the explosive energy conversion is still an open question. It is believed that the substorm triggering process is intimately related to the following fundamental problems in magnetospheric physics: (a) the mechanism for the magnetotail formation, (b) the magnetopause structure and the associated momentum-energy transfer process and (c) the origin of the auroral current sheet.

This award will support theoretical research into these areas in order to improve our understanding of the magnetospheric substorm.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0006, IMAGE PROCESSING

R.M. Batson, U.S. Dept. of the Interior, Geological Survey, Br of Astrogeologic Studies, *601 E. Cedar Ave., Flagstaff, Arizona* 86001 (9580-00991)

The Image Processing Facility will continue to provide custom processing of Landsat and planetary spacecraft pictures, and digital arrays of spatial geologic, geophysical, and geochemical data to support investigations of the Geologic Division.

Research will continue in the development of new techniques for the manipulation of spatial data. Specifically the following investigations are under way: 1. Derivation of topographic data by processes involving computation of ratios between bands of multispectral images. 2. Continued development of methods of correlating and displaying geophysical, geochemical, topographic and other non-image data. 3. Development of new multispectral clustering methods for image classification. 4. Development of digitally encoded catalogs of geologic features on the planets. 5. Development of techniques of using line digitizing equipment for editing and revising raster formatted data. 6. Continued development of techniques for making maps and mosaics, both in black and white and in color, of digital television images from spacecraft.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0007, ENERGY AND MOMENTUM BUDGETS OF THE ATMOSPHERE OVER THE TROPICAL PACIFIC OCEAN

B.C. Weare, University of California, Davis Campus, School of Agriculture & Environmental Sciences, Dept. of Land Air & Water Resources, *Davis, California* 95616 (ATM77-14669)

Large-scale sea surface temperature anomalies in the eastern tropical Pacific have been shown to have significant far-reaching meteorological consequences, not only within the tropical atmosphere, but within the extratropical troposphere as well. Recent studies have indicated that this region not only shows the most convincing evidence of significant air-sea interaction but also suggests that it may be very important in influencing global 'climate' variations having periods of years to decades. The general aim of this study is to discern the mechanisms of the atmospheric response and the possible return effect back onto the ocean by using all available data for the atmosphere over the tropical Pacific. The data base would include not only the rather sparsely spaced observations at meteorological stations but also air, sea, and dew point temperatures and resultant winds derived from marine report summaries and the more recently available satellite estimates of cloud brightness, radiative fluxes, and liquid and vapor water content. In order that our conclusions might have the greatest possible statistical and physical significance, the period of the investigation will be nearly the entire epoch of upper air observations, 1957-75, and the area will include the entire Pacific basin east of about 120 degrees E between 30 degrees N and 30 degrees S. The aim of the study is to calculate variations in the most important components of the atmospheric energy and momentum budgets. These calculations can then be compared with or incorporated into mathematical models of the global circulation.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0008, CUMULUS CLOUDS, MESOSCALE CONVECTIVE SYSTEMS AND THEIR INTERACTIONS

W.R. Cotton, Colorado State University, School of Arts Humanities & Social Sciences, Dept. of Atmospheric Science, *Fort Collins, Colorado* 80523 (ATM76-83361 A01)

The South Park Area Cumulus Experiment (SPACE) is designed to study and describe cumulus clouds and their interactions with each other, the mesoscale, and the synoptic scale. The objective of the study is to use these data to develop a numerical simulation which accurately predicts the genesis, movement and precipitation intensity of cumulus cloud systems for given synoptic and mesoscale features. The numerical simulation should be suitable for use in improved prediction of cumulus and mesoscale weather phenomenon and to evaluate possible modification techniques for precipitation enhancement and severe storm abatement. The field experiment is located in South Park, Colorado, so as to utilize the cumulus genesis area created by the Mosquito Range located on the western boundary of the park and the large flat park to the east of the range to study the initiation and growth of clouds and their subsequent movement.

The field measurements program, to be conducted in summer of 1977, is model interactive and to date has made significant progress in understanding cloud initiation, cloud growth, cloud microphysics, and climatological aspects of cloud translation and propagation. This research would build on these studies with the primary focus of the research being the measurement, description, and the development of a data set from which models of cumulus scale and mesoscale interactions can be developed and verified.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0009, A NUMERICAL STUDY OF HALOCARBON CHEMICAL REACTION ON STRATOSPHERIC & TROPOSPHERIC OZONE & OTHER PHOTOCHEMICAL PROCESSES (ABBREV)

P.J. Crutzen, Colorado State University, School of Engineering, Dept. of Atmospheric Science, *Fort Collins, Colorado* 80523 (R804921-02; G603A-AI-06)

The purpose of this research is to obtain an understanding of the modification of the atmosphere caused by the release of halogenated chemicals. To accomplish this goal, numerical models of the atmosphere have been and will be further developed which accurately describe the photochemical and physical processes occurring in the atmosphere. Research conducted during the first year has indicated that the clean troposphere may not be as efficient a scavenger of halocarbons as previously believed. An understanding of the role of the troposphere as a removal mechanism for these halogenated compounds can be better achieved if a good knowledge of the tropospheric carbon monoxide budget is obtained. Thus, although the CO budget is discussed in the first year's research results, the second year's research efforts will concentrate on minimizing the uncertainties of this budget due to soil absorption and release and nonmethane hydrocarbon oxidation. The other major facet of the second year's research will be to have a two-dimensional, time-dependent, global scale, photochemical model (including chlorocarbons) of the troposphere and stratosphere operational by the end of the second year of the project.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0010, SEA CURRENT RADAR

D. Barrick, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8AA73157)

PROJECT OBJECTIVE: 1. To develop, demonstrate, and perfect transportable HF radar systems for the measurement of coastal surface currents. 2. To apply this new remote sensing tool to oceanographic investigations.

CURRENT YEAR PLAN: 1. To continue improvements to the radar hardware and software. 2. To isolate and estimate error sources in the system. 3. To interpret and publish the data on currents in the Straits of Juan de Fuca. 4. To begin transition engineering.

PROGRESS REPORT: 1. Four field experiments successfully completed. 2. Software improved.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0011, STRATOSPHERIC MONITORING

A.L. Schmeltekopf, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8DJ44083)

PROJECT OBJECTIVE: Conduct an experimental program to monitor the long-term changes in the concentrations of stratospheric constituents which are found to have the potential for upsetting the stratospheric ozone balance.

CURRENT YEAR PLAN: A comprehensive critical species measurement program will be continued to obtain altitude profiles, study temporal variations (both systematic, e.g., seasonal, solar cycle, etc., and non-systematic or at least non-correlated variations) and study geographical variability. Several techniques will be used to carry out this program i.e., grab samples, flyable gas chromatograph, resonance fluorescence, optical obsorption and laboratory rate constant measurements.

PROGRESS REPORT: Eight balloon flights into the stratosphere were made during FY-78 to obtain grab samples. Two from Antarctica, 2 from a new station in Brazil, and four from Laramie, WY. These were analyzed for N2O, F-11, F-12, and CH4. A new technique for analyzing gases in the gas chromatograph has been developed which will allow us to make measurements of many more species in our grab samples. Four flights were made using a new instrument for measuring water vapor in the stratosphere. The instrument is very sensitive and clearly has the ability to measure H2O but since the results we get are different from those expected, we are still making tests before releasing the data. Ground based measurements on NO, NO2 O3 and J*NO2 were made which indicate that the presumed simple chemistry related to those compounds is not adequate. A more complete check of this conclusion is now being made on board the research ship, KNORR, in mid-Pacific. It is expected that these measurements will have considerable impact on our understanding of the tropospheric odd nitrogen chemistry.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0012, PRECIPITATION EFFECTS ON LASER BEAMS

T. Wang, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8AA70312)

PROJECT OBJECTIVE: Experimental studies of the use of laser beams for remotely measuring atmospheric precipitation.

CURRENT YEAR PLAN: Test in an automatic mode, several optical methods of measuring rainfall rate and drop size distribution, and identifying type of precipitation and other obscurations to visibility.

PROGRESS REPORT: Laser weather identifier has been installed at Denver airport and is running on regular basis. Saturation effect of heavy rain has been observed and measured.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0013, OPERATIONS AND TECHNOLOGY TRANSFER

K.E. Wilk, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., *Boulder, Colorado* 80302 (8C370404)

PROJECT OBJECTIVE: Using subsynoptic and mesoscale conventional meteorological sensors, provide continuous measurements of temperature, pressure, moisture, and wind conditions in the boundary layer during the Laboratory's severe storm observational programs. Develop and implement the necessary operating and quality control procedures to support the rawinsonde and tall tower (500 m) facilities, which together provide detailed vertical profiles of meteorological conditions in severe storm environs. Conduct research on operational use of weather radar for rapid detection and recognition of characteristics indicative of severe weather events, including hail, heavy rain, tornadoes, strong winds, and turbulence. Coordinate with other Government agencies (FAA, NWS, ERDA, etc.) to effectively define and transfer new technology developed at NSSL, to assist the operating groups of these agencies in improving their systems and procedures.

CURRENT YEAR PLAN: Continued collection and analysis of severe storm events including tornadoes, gust fronts, heavy rainfalls, hail and turbulence, analyze radar reflectivity and velocity data to determine detectability, motion, and predictability of thunderstorm hazards, and investigate use of satellite data as additional data resource.

PROGRESS REPORT: The development and testing of digital processing and recording equipment for the tower and remote sites is continuing. The characteristics of radar observations (from both conventional and Doppler radar) collected during severe storms were analyzed with concurrent aircraft, surface

and tower data collected during severe storms. The first year of a planned twoeyear test to transfer Doppler radar technology (developed at NSSL and AFGL) to the NWS and AWS (USAF) was successfully completed. Several documents were produced from those tests and other analyses, including the development of training material for Federal Aviation Administration and the National Weather Service and research reports on potential applications.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0014, THEORY OF PLASMA WAVES, ELECTRON STREAMS, AND RADIO-WAVE EMISSION DURING TYPE III SOLAR RADIO BURSTS

M.V. Goldman, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Astro Geophysics, *1200 University Ave., Boulder, Colorado* 80302 (ATM76-14275 A01)

The theory of Type III solar radio bursts is developing rapidly. Preliminary work indicates that the processes of parametric instability and soliton collapse, in two and three dimensions, are important determinants of the behavior of the Langmuir waves associated with Type III solar radio bursts. These effects tend to keep Langmuir wave levels much lower than previously believed, in agreement with observations. This grant will extend two-dimensional calculations, within the context of a tractable realistic numerical model for beam-plasma interactions, which would include wave growth caused by the electron bump-on-tail distribution, parametric instabilities, soliton collapse, and finite bandwidth pump effects. The results of this calculation will enable quantitative comparison with observations. We shall further use the results of this calculation to form an integrated picture of stream propagation, Langmuir wave, and radio wave emission. The overall objective of this grant is to further our understanding of solar plasma physics as it relates to radio wave emission.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0015, EXPERIMENTAL VERIFICATION OF THREE-DIMENSIONAL THERMAL DISCHARGE MODEL

S. Sengupta, University of Miami, School of Engineering & Environmental Design, Dept. of Mech Engin, *Coral Gables, Florida* 33124 (D8-X0166; F624A-396)

The objective of this work is to verify at two geographically diverse power plant sites the predictive capability of the thermal plume mathematical model developed by the University of Miami and to transfer the theory and operation of the computer program for this model to EPA.

The model will be demonstrated in at least two 24-hour periods at Anclote River and Anchorage, Florida and Lake Keowee, South Carolina. Model predictions at various times in the 24-hour periods will be compared with remote sensing and field measurements in the verification process. The mathematical model theory and computer software books will follow verification of the model.

The computer program for the verified model will be transferred to a designated EPA computer facility and instruction provided to EPA modelers on the application of the model. A final report will document both model theory and computer software information, and information related to verification of the model.

The project was initiated in June 1978 and data for model verification was collected at the Anclote site during June 19-20, 1978. Reduction of these data is underway.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Industrial Environmental Research Lab.

5.0016, REMOTE SENSING OF WATER QUALITY PARAMETERS-SEDIMENTATION ALONG THE AROOSTOOK RIVER IN MAINE

T.J. Keating, University of Maine, Orono Campus, Land & Water Resources Inst., Dept. of Civil Engin, *11 Coburn Hall, Orono, Maine* 04473 (A-049-ME)

Black and white color infrared photography from low-altitude aerial overflights will be used to detect concentrations of non-point source sedimentation loadings from agricultural runoff along a selected portion of the Aroostook River in potato-producing northern Maine.

Integrated depth samplers and subsequent laboratory analysis of turbidity and suspended solids determine sedimentation levels at spatially positioned sample points within the Parkhurst siding watershed pilot study area.

These concentrations can then be correlated to the film image densities depicting the selected sampling points. The microdensitometric analysis will model the effects of differential exposure levels, developing, handling and film type such that sedimentation concentrations can be determined along a twelve-mile stretch of river with minimal ground truth.

Knowledge of sedimentation levels when integrated over depth will allow soil conservationists to assess the severity of erosion problem both before and after land treatment measures. A monitoring tool will thus become available to pinpoint severe non-point pollutants elsewhere within the state of Maine.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0017, SATELLITE MOSAIC OF ANTARCTICA

D.R. Wiesnet, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service, *Suitland, Maryland* 20233 (DPP77-27010)

The National Oceanic and Atmospheric Administration (NOAA) will prepare a photomosaic on Antarctica from NOAA weather satellite imagery. The imagery needed has not yet been collected; however, as part of the project, NOAA will schedule sufficient recorded passes over Antarctica to provide cloud-free, visible-band images of all land areas during the austral summer. The National Environmental Satellite Service will enhance and rectify the satellite data through the use of computer-compatible tapes to produce the images at a scale of 1:5,000,000. The rectified images will be submitted to the U.S. Geological Survey for probable publications and distribution to the public of the resulting photomosaic of Antarctica. Such a photomosaic will be of value to scientists of many disciplines, logisticians, and the public.

No antarctic field work is planned under this project.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0018, COMPUTATIONS OF SEA SURFACE MICROWAVE BRIGHTNESS TEMPERATURE

J. Alishouse, Geo Atmospherics Corp., *Box 117, Lincoln, Massachusetts* 01773 (7-631; M0-A01-78-00-4010)

OBJECTIVE: The objective of this study is to develop a model that will permit the computation of brightness temperatures from microwave radiances for a finite field-of-view.

APPROACH: Utilizing antenna patterns from either the SEASAT-A or Nimbus-G Scanning Multifrequency Microwave Radiometer (SMMR) and sea surface brightness temperatures, the contractor will develop a mathematical model which performs the necessary integration over the field-of-view defined by the antenna pattern.

CURRENT PLANS: To have a working model capable of providing useful surface temperature measurements from the SMMR instrument in time for the launch of SEASAT-A and Nimbus-G.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0019, SPACECRAFT CHARGE MODELING

L.W. Parker, Lee W. Parker Incorporated, *Concord, Massachusetts* (DF581770; F19628-78-C-0149)

AF function - space systems survivability. Deficiency - inadequate knowledge of the interaction between the energetic particle environment at synchronous orbit altitudes and the potential field of a charged satellite is detrimental to the design of future

space systems. Objective - validation of present static models with geosynchronous data and the development of a time-dependent code. How research contributes -validation of present models will lead to confident application of those models to the SCATHA satellite. Development of a new time-dependent code will provide a check for AFGL's present in-house time-dependent code.

Static charging models will be validated using currently available satellite data. Analytic and numerical techniques will be utilized to develop a time-dependent code.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0020, COMPOSITION AND CARBON-14 CONTENT OF GAS IN ICE AT THE ANTARCTIC METEORITE SITES

E.L. Fireman, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (DPP78-05730)

Meteorites have been found in the ice at the edges of the antarctic ice sheet in recent years. These meteorites fell on the ice sheet tens of thousands of years ago and are now exposed in areas where the ice is being lost by melting and sublimation. The history of these meteorites may be deduced by their inter-relationship with the ice. This proposed project will analyze gas in ice samples collected at the antarctic sites where the meteorites are found. The N2, O2, Ar, and CO2 contents, isotopic compositions, and the carbon-14 radioactivity will be measured. The combination of the age and composition of the gas in the ice with the fall times of the collected meteorites is a new source of information for glaciology, atmospherics, and meteoritics.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0021, IMPROVED DETERMINATION OF THE GRAVITY FIELD BY USE OF SEASAT

G. Hadgigeorge, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582360)

AF function - estimation and refinement of the earth's gravity field. Deficiency - lack of detailed knowledge of the gravity field contributes to missile guidance errors. Objective - determine the global gravity field with maximum accuracy and precision from satellite altimetric measurements, gravimetric observations and other geophysical data. How research contributes - improved missile guidance performance from reduction of geodetic and gravity errors.

Mathematical algorithms will be tested and/or modified for highly efficient data processing, so that a detailed global gravity field can be constructed. The accuracy and resolution of altimeter residuals will be assessed to determine their usefulness in depicting short-wavelength geoid features. Develop quantitative gravity prediction methods by correlating short-wavelength geoid residuals with geophysical features of the ocean.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0022, EFFECT OF BEAM-PLASMA INTERACTIONS IN HIGH LATITUDE IONOSPHERE

E.G. Fontheim, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Atmospheric & Ocean Science, *Ann Arbor, Michigan* 48104 (ATM77-24960)

This grant funds studies of precipitating particles and of the causes and effects of plasma turbulence in the high latitude ionosphere. It allows: 1) The analysis of electron precipitation spectra aimed at learning more about their origin as well as about their effect on the background plasma. This study involves extensive use of data from AE-C and D, INJUN5, Hawkeye 1, and the IMP series. 2) Investigation of whether downstreaming energetic protons may transfer their energy to electrons on auroral field lines in regions of plasma turbulence thereby giving rise to intense inverted-V precipitation. 3) Study of the mechanisms which could give rise to plasma turbulence and anomalous transport effects at lower altitudes (h less than or equal to 500 km) and solution of the coupled set of conservation equations with anomalous transport coefficients. This study involves extensive use of Chatanika Incoherent scatter radar data and satellite data from AE-C and D and S3-3.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0023, DISEASES OF SHADE AND ORNAMENTAL TREES IN URBAN FORESTS

H.L. Morton, University of Michigan, Ann Arbor Campus, School of Natural Resources, *Ann Arbor, Michigan* 48104 (0074753; MICY00107-F)

OBJECTIVE: Study the etiology and control of diseses of shade and ornamental trees growing in urban areas.

APPROACH: Shade and ornamental trees common to urban areas will be examined for diseases. Root rot fungi and mycorrhizae will be evaluated with respect to symptoms of decline or poor vigor. Ground evaluations will be compared to evaluations by remote sensing. Urban trees planted in difficult planting areas, including areas subject to drought, salt, and soil compaction, will be examined for soil microorganisms.

SUPPORTED BY Michigan State Government

5.0024, TROPHIC CLASSIFICATION OF LAKE MEAD UTILIZING CONTACT AND LANDSAT DATA

D.H. Boland, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab., Water & Land Quality Branch, *P.O. Box 15027, Las Vegas, Nevada* 89114 (J613B-22)

OBJECTIVE/APPROACH: The general objective is to determine the utility of LANDSAT multispectral scanner data for the investigation of the spatial-temporal aspects of trophic indicators and trophic state in a large lake (Lake Mead). Specific objectives include: 1. Development and evaluation of models to predict the magnitude of selected trophic indicators. 2. Development and evaluation of models to predict the trophic state of a lake. 3. Generation and evaluation of thematic photomaps which depict trophic indicator magnitudes and trophic index values within a lake.

Water quality data were collected from Lake Mead on 8 different dates during 1976 concurrently or near-concurrently with LANDSAT and NASA aircrafts. Remotely sensed data were acquired by multispectral scanners and aerial mapping cameras. Multispectral data from 20 LANDSAT scenes are being compared with water quality data obtained from some 40 lake sampling sites and, if statistically significant relationships are found, thematic photomaps will be generated. The maps will display the temporal-spatial aspects of trophic indicators and a trophic index.

FINAL OUTPUT: A report will be written describing the project results for use by other EPA, Federal, and State Agency monitoring personnel.

RESULTS TO DATE: Significant correlations between remote data and Water Quality parameters have been identified.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab.

5.0025, DEVELOP LASER FLUOROSENSORS FOR MONITORING SURFACE WATER CHLOROPHYLL A

M. Bristow, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab., Remote Monitoring Methods Br, *P.O. Box 15027, Las Vegas, Nevada* 89114 (J620A-45)

OBJECTIVE/APPROACH: Develop an airborne laser fluorosensor capable of measuring and mapping surface water cholorophyll a concentrations and monitoring fluorescent tracing dyes. The airborne laser fluorosensor employs a flashlamp pumped dye laser tuned to the absorption peak of chlorophyll a. The laser-induced fluorescence is collected by a telescope and focussed onto a detector. Correction for variation in water transmission is made by monitoring the laser-induced water OH stretch Raman band. The signal is displayed on a CRT, digitized and recorded on magnetic tape. By making repeated passes in a fixed

or rotary wing aircraft, it will be possible to produce a map of chlorophyll fluorescenceltò-water Raman ratio for use as an indicator of surface water chlorophyll a concentration.

FINAL OUTPUT: Development results will be described in an EPA report. Developed hardware will be available to EPA, Federal and State Agencies for applications.

RESULTS TO DATE: The system is currently being evaluated in a helicopter. At a height of 1000 ft. above the water surface, good signal-to-noise ratios are obtained for surface chlorophyll concentrations of the order of 1 microgram/1.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab.

5.0026, DESIGN MODIFY MOBILE TM STA/SUPPORT

C. Erickson, New Mexico State University, Las Cruces Campus, Graduate School, *University Park, Las Cruces, New Mexico* 88003 (DF580140; F19628-78-C-0070)

AF function - remote balloon flight support capability. Deficiency - lack of Air Force mobile computer-interfaced PCM telemetry and command control facilities applicable to balloon control from remote locations. Objective - provide state-of-the-art telemetry and balloon control facilities at AFGL mobile ground station. How research contributes -increases the versatility and cost-effectiveness of scientific balloon platforms by providing experimenters the capability for high data rate PCM telemetry reception and balloon control functions from a mobile ground station at remote sites.

Design and fabricate special computer interface and display equipment for a PCM ground station. Provide hardware and software interface for the mobile station-installed equipments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0027, WAVES AND WAVE COUPLING IN THE ATMOSPHERE

S.H. Gross, Polytechnic Inst. of New York, Brooklyn Campus, School of Science & Engineering, Dept. of Engineering, *333 Jay St., Brooklyn, New York* 11201 (ATM78-09509)

This grant funds research on the transport of energy and momentum by wave processes in the upper atmosphere and on the source regions for these waves. The data base utilized for this purpose will include data from the Atmospheric Explorer satellite. The effort will accentuate those waves that may originate in auroral regions or in lower layers of the atmosphere, as, for example, the troposphere. The research is concerned with the mechanisms for the propagation of these waves through the layers of the atmosphere and the deposition of their energy and momentum in these regions.

It is planned to select and analyze density data for individual species and the total medium, as well as temperature and species velocity data to seek correlative behavior between species and evidence of their wave amplitude and phase responses. Modeling analysis will enable the determination of important wave parameters from the data and will indicate the direction to the energy source region. Correlative studies with other geophysical data, with meteorological data, with data from incoherent backscatter radar, with Doppler sounder and ionosonde data will also be utilized to infer source locations and characteristics. The deduced wave parameters will enable the determination of momentum and energy transport fluxes as well.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0028, CHARACTERIZATION OF GASEOUS EMISSIONS FROM STATIONARY SOURCES BY REMOTE SENSING

W.F. Herget, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab., Emissions Measurement & Characterization Div., Special Techniques Group, *Research Triangle Park, North Carolina* 27711 (G712B-BD-17)

OBJECTIVES: Use ground-based remote sensing methods to determine species identity and concentration of gaseous pollutants emitted by point and extended area stationary sources; determine optimum spectral regions for monitoring specific pollutants.

APPROACH: Longpath high-resolution infrared spectroscopy will be used in absorption and emission to determine the spectral characteristics of gaseous pollutants emitted by a variety of sources. Laboratory spectra of various species will be obtained to assist in species identification and concentration determinations. Longpath gas-filter correlation methods will also be used.

CURRENT PLANS/PROGRESS: Measurements using a grating spectrometer have been made at coal-burning power plants, incinerators, gas purification plants and carbon black plants. The grating spectrometer has been replaced with a Fourier transform spectrometer to greatly increase spectral resolution and sensitivity. A variety of sources will be studied in future years.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0029, AIRCRAFT RADIATION MEASUREMENTS OVER ST. LOUIS

T.N. Carlson, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (R805500-01; G603A-AA-36)

Aircraft radiation measurements made on board the Penn State Aerocommander during the 1976 and 1974 St. Louis RAPS project will be processed and the data reduced for the purposes of assessing the effects of aerosols in the urban boundary layer on transmission and for testing of radiative transfer models.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Sciences Research Lab.

5.0030, ANALYSIS OF DATA FROM THE MAGNETOSPHERE AND SOLAR WIND

A.J. Dessler, Rice University, Graduate School, Dept. of Space Physics & Astronomy, *6100 Main St., Houston, Texas* 77001 (ATM77-12619 A01)

This grant will support an investigation of a limited number of specific, well-defined questions relating to the physics of the earth's magnetosphere, through an extensive and coordinated program of theoretical development and analysis of data from a variety of past and present satellite and ground-based experiments. This program will involve a large measure of cooperation among several American and European scientific institutions and will contribute in a significant way towards the overall objectives of the International Magnetospheric Study (IMS).

The research is directed towards answering the following three fundamental questions: (1) How does the solar wind control the electric potential drop across the polar cap that drives magnetospheric convection; (2) What mechanisms are responsible for the injection and acceleration of solar-wind plasma at the magnetopause; and (3) What are the relationships among magnetospheric convection patterns, auroral morphology, particle precipitation patterns, and field-aligned currents.

Theoretical research on the above topics has advanced to a stage where several significant observational tests are necessary and feasible. Several other crucial tests will become feasible during the period of the IMS, given a modest level of effort in refining and applying existing theory. The intent is to provide a balanced program of coordinated data analysis and theoretical development that will complement and enhance the data-acquisition programs of the IMS.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0031, NONLINEAR TRANSFER OF KINETIC ENERGY IN THE ATMOSPHERE USING ONE- AND TWO-DIMENSIONAL SPECTRAL REPRESENTATION

D. Djuric, Texas A & M University, College Station Campus, School of Geosciences, Dept. of Meteorology, *College Station, Texas* 77843 (DF051280; AF-AFOSR-3492-78)

AF function - the AF Global Weather Center uses a numerical model to forecast global meteorological conditions in support of AF operations. Deficiency - the physics of the atmospheric energetics are obscured by numerical techniques and limitations. Objective - to investigate the nonlinear transfer of kinetic energy for the Northern Hemisphere by two methods and determine if the forecast models are correctly handling this important parameter and if the one- and two-dimensional spectral representations yield comparable results. Contribution - such spectral representations of dynamic models yield great insight into their representation of the physics and may be the future generation forecast model.

To use the spectral representation now available for the entire Northern Hemisphere and investigate the nonlinear transfer of kinetic energy. Both one- and two-dimensional analyses will be used and a comparison of the two techniques made.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

5.0032, STUDY OF TRIGGERED ELECTRON PRECIPITATION FROM AN EXPLOSIVE DETONATION IN THE IONOSPHERE

W.R. Sheldon, University of Houston, School of Arts & Sciences, Dept. of Physics, *3801 Cullen Blvd., Houston, Texas* 77004 (ATM76-82653 A02)

Two SuperArcas rockets were launched during February 1977 to measure the X-ray flux from precipitating auroral electrons in conjunction with two high-altitude releases of cesium. The purpose of the experiment was to study auroral triggering mechanisms and the code name of the study is Project Trigger. The launches were conducted at Kiruna, Sweden in collaboration with Swedish and other U.S. investigators. Data were collected during these flights and this amendment will permit their analysis. The aim of the study is to study the response of the quiet time auroral zone ionosphere and magnetosphere to the injection of cold plasma; in this case, cesium.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0033, DIRECT MEASUREMENT IN SATELLITES OF IONOSPHERIC PROPERTIES

F.S. Johnson, University of Texas, Dallas Campus, Center for Space Sciences, *Richardson, Texas* 75082 (INT78-08788)

The scientific aim of the project is to develop a program of comparative investigations within the field of ionospheric physics based on direct measurements in Satellites from the East-West Satellite Series. The Central Laboratory for Space Research of the Bulgarian Academy of Sciences will utilize measurements in the Intercosmos series of satellites. The Center for Space Sciences at the University of Texas, Dallas will utilize measurements in the Atmosphere Explorer.

The objectives of the project are twofold within the broad framework of in situ measurement of ionospheric properties.

1. To develop realistic understanding of U.S. and Bulgarian measurement techniques and accumulated data base. 2. To exploit these data and diverse approaches of interpretation to study the interactions between the Earth's ionosphere and magnetosphere, in particular, the problem of global morphology and the nature of the transition region between O ions and the light ions H and He.

This work is in collaboration with Professor Kiril Serafimov and Dr. Ivan Kutiev of the Central Laboratory for Space Research, Sofia, Bulgaria.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

5.0034, SATELLITE SENSING AND RADIATIVE TRANSFER

K. Liou, Utah Higher Education System, University of Utah, School of Mines & Mineral Industry, Dept. of Meteorology, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DF051900; AFOSR-78-3576)

AF function - remote sensing of atmospheric properties from satellites is the only feasible method of acquiring the worldwide coverage necessary for prediction model initialization, target weather identification, data collection for support to E/O surveillance systems and the development of climatologies. Deficiency - clouds and precipitation adversely effect microwave remote temperature sensing measurements. The effect of clouds on solar heating of the atmosphere and rainfall rates can possibly be extracted from the temperature data. Objective - to understand the effect of atmosphere moisture on microwave soundings of the atmosphere and test the thesis that information as rainfall rate can be obtained from the microwave measurement. Contribution - several microwave sounders are currently aboard NOAA and DOD meteorological satellites. This research will enhance the information obtained by these instruments.

The effects of clouds and precipitation on NIMBUS and DMSP microwave sensors data will be analyzed. Attempts will be made to jointly use the IR and microwave data to enhance the microwave measurements. Radiative transfer for the microwave channels in the presence of hydrometeors will be developed and the effects of cirrus clouds on solar heating investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

5.0035, A STUDY OF THE DISPERSAL OF SUSPENDED SEDIMENT FROM THE FRASER RIVER INTO NORTHERN PUGET SOUND USING LANDSAT IMAGERY

R.A. Feeley, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs., Pacific Marine Environmental Lab., *2725 Montlake Blvd. E., Seattle, Washington* 98112 (122 (NOAA/EAO No.))

Suspended matter data and LANDSAT imagery will collected for the northern Puget Sound and Strait of Juan de Fuca areas for correlation. If the correlations are reasonably consistent in time and space, the data will be used to develop suspended matter distribution maps from digital tapes from previous years. The distribution maps so obtained will be compared with historical records of the Fraser River discharge to provide a synoptic picture of the relationship between annual and season variations in river discharge and suspended sediment distributions.

SUPPORTED BY U.S. Environmental Protection Agency

5.0036, THE NORTH PACIFIC EXPERIMENT (NORPAX) - STUDIES OF THERMOCLINE FLUCTUATIONS IN THE PACIFIC NORTH EQUATORIAL COUNTER CURRENT

B.A. Taft, University of Washington, School of Arts & Sciences, Dept. of Oceanography, *Seattle, Washington* 98105 (OCE77-24486)

This project is part of the North Pacific Experiment (NORPAX). The long-range goal of NORPAX is to understand fluctuations in the upper layers of the Pacific Ocean with time scales of months to years and space scales in excess of 1,000 kilometers, and the relationship of these oceanographic fluctuations to the overlying and adjoining atmosphere. Achievement of this goal should evenutally lead to improved weather/climate prediction for both the Pacific Ocean and North America.

One major component of NORPAX is a coordinated field program to determine the space and time variability of the density and velocity fields in the upper layers of the Equatorial Pacific current system. This field program will occur between November 1977 and February 1978 and will involve the efforts of a number of scientists. Measurements will be made from ships, airplanes and moored instruments. This grant will provide funds for Dr. Taft to participate in the experiment design, execution, and data analysis. More specifically, he will study the temperature data from five thermistors arrays which will be located along 150 degrees W between 5N and 10N.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences

5.0037, CHANNEL MORPHOLOGY AND SEDIMENTATION IN PHEASANT BRANCH NEAR MIDDLETON

R.S. Grant, U.S. Dept. of the Interior, Geological Survey, Water Resources Division, *Madison, Wisconsin* 53706 (WI 77-084)

Severe channel and bank erosion in Pheasant Branch and accelerated sediment deposition in both Pheasant Branch Marsh and Lake Mendota are occurring within the basin. The problem is not unique to Pheasant Branch but occurs throughout the country. To study any more than a small percentage of these areas, remote sensing techniques need to be employed. On-site measurements of various erosion and water-quality parameters are needed to calibrate the remote-sensing imagery and evaluate the applicability of remote sensing in the detection and monitoring of sedimentation and water quality.

The objective of the project is threefold: (1) to evaluate sedimentation and stream-channel morphology in the Pheasant Branch basin; (2) to obtain ground measurements of sediment transport, streamflow, and channel properties; and (3) to evaluate remote-sensing techniques with respect to detection and monitoring sediment loadings in small basins.

During the five-year project the following items will be completed for Pheasant Branch basin: (1) evaluate the headwater erosion and stream-channel morphology; (2) analyze effects of urbanization on stream-channel morphology, sediment transport, and delta formation; (3) project changes in channel geometry, streamflow, and sediment transport; (4) delineate between stream-channel and upland erosion; (5) identify critical areas of erosion and suggest required management practices; (6) supply cooperator with sediment transport, streamflow, sediment-source, and channel-geometry data for remote-sensing imagery calibration; and (7) evaluate the accuracy, applicability, and transferability of remote sensing as a tool in sediment monitoring.

Installed and operated 4 gaging stations and 3 automatic sediment samplers in basin. Re-surveyed channel cross sections originally surveyed in 1971. Collected streamflow and sediment data during runoff events. Installed recording raingage at U.S. Highway 12 gaging station.

Continue monitoring streamflow and sediment at gaging stations. Compare 1971 channel survey and 1977 re-survey. Survey additional cross sections at sites throughout basin. Evaluate Middleton storm-water management study. Study bed and bank material.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0038, ENVIRONMENTAL IMPACTS OF RESOURCE MOBILIZATION IN THE HUMID TROPICS/DEVELOPMENT IN QUINTANA ROO, MEXICO

C.R. Edwards, University of Wisconsin, Milwaukee Campus, School of Letters & Science, Dept. of Geography, *Pearse Hall, Room 107, Milwaukee, Wisconsin* 53201 (SOC78-08475)

Quintana Roo, Mexico, until recently an underpopulated and underutilized tropical region, is presently undergoing massive development, the success of which will depend ultimately upon the congruence among cultural systems, development strategies, and the ability of ecological bases to sustain such development.

The 1955 predevelopment landscape will be reconstructed, and the processes and impacts of technological innovations in crop agriculture, livestock husbandry, lumbering, and fishing will be analyzed, using LANDSAT imagery as well as standard field observation, mapping, and interviewing.

This research will contribute to understanding the ability of humid tropical environments to meet expectations for increased food production and settlement of surplus populations. The historical-geographical reconstruction provides a base line for measurement of subsequent changes and their impacts, and is prerequisite to formulation of theory concerning the conduct and consequences of modern development in the humid tropics.

SUPPORTED BY U.S. National Science Foundation, Div. of Social Sciences

5.0039, WATER AND ITS RELATION TO ECONOMIC DEVELOPMENT IN THE GREEN RIVER AND GREAT DIVIDE BASINS IN WYOMING

H.W. Lowham, U.S. Dept. of the Interior, Geological Survey, Water Resources Division, *Cheyenne, Wyoming* 82001 (WY 75-030)

Development of extensive coal, oil, gas, trona, and oil-shale resources in the project area will require a projected increase in water consumption of 480,000 acre-feet per year by 1990. Development of energy resources in other parts of the state also will require large amounts of water; transbasin diversion of Green River water to other areas could total an additional 270,000 acre-feet per year. Water planners and managers need much more information about available ground and surface water, present quality of the waters, and the impacts on water supply and quality caused by development of energy resources.

The study will be designed to gather information, and make available to interested industrial, agricultural, and governmental people, interpretive reports that describe: (1) the distribution and quality of surface water in space and time, (2) relationships between surface water and ground water, (3) the distribution, quantity, and quality of ground water, and (4) hydrology-related aspects of the environment. Efforts of the study will be directed towards: (1) describing the water resources and hydrologic relationships that presently exist, (2) developing predictive methods that may be used to describe future conditions, including reactions to increased water development, (3) establishing monitoring programs for detecting possible changes in water parameters.

Compile and evaluate existing water data. Conduct literature search for present hydrologic knowledge of the area. Prepare planning report during first year of project, outlining the specific techniques to be used in subsequent phases. Regarding water quality, particular attention will be given to trace metals, biological parameters, and trend analysis. Channel-geometry techniques, ERTS imagery, and detailed statistical analyses will be applied to surface-water studies. Aquifer tests and bore hole and surface geophysical surveys will be used in ground-water studies. Digital models will be developed for chemical-quality and surface-water systems.

A helicopter will again be used to aid data collection of a large number of springs and streams. Two different sampling trips, once during base flow, and again during snowmelt runoff, are planned. Diurnal measurements of pH, conductivity, temperature, dissolved oxygen, and discharge will be conducted. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, ASPT IP INTEGRATED DYNAMIC VISUAL DISPLAY DEVELOPMENT

R.G. Woodruff, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF224240)

The objective is to develop an integrated dynamic visual display for the ASPT advanced instructor/operator station (AIOS) which will provide aircraft flight status information and predictor display information, including such parameters as airspeed, altitude, attitude, angle of attack, heading, g force and desired track. Ultimately the display will be used by instructor pilots in conjunction with the performance of flying training research in the ASPT.

Phase I - display design - IPs will be administered a questionnaire to determine what integrated display information would be useful to them for evaluating student pilot performance. From the analysis of the data several display designs will be developed and sketched. IPs will than rank-order the various designs. Phase II - display evaluation - the two highest ranking designs will be implemented on the ASPT AIOS. Ten IPs will each instruct one student under each display configuration in addition to a condition in which only the usual AIOS/CIO information is available. The

number of trials required to reach a criterion level of proficiency will be recorded. IPs will be administered a questionnaire to determine the preferred display configuration. Parametric and non-parametric statistical tests will be used to analyze the trials-to-criterion data and questionnaire, respectively. If modified display is recommended, the cycle will be repeated until an optimal design is identified.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, LIMITED CONTINUOUS SPEECH RECOGNITION FOR AIR INTERCEPT CONTROLLER TRAINING

J. Porter, Logicon Inc., *P.O. Box 10179, San Diego, California* 92110 (DN894016; N163-3978C0044)

Develop a software package for real-time, limited continuous speech recognition for the air intercept controller vocabulary.

Mathematicians and systems engineers will define requirements and code software to demonstrate capabilities.

SUPPORTED BY U.S. Dept. of Defense, Navy, Human Factors Lab.

6.0003, GZ EFFECTS ON HUMAN OPERATOR PERFORMANCE

D.L. Klienman, University of Connecticut, Storrs Campus, School of Engineering, Dept. of Electrical Engin, *Box U-37, Storrs, Connecticut* 06268 (DF324400; F33615-78-C-0517)

The intent of this work unit is to upgrade the TAC Avenger air-to-air engagement model with an improved human tracking model subroutine which includes the effects of high-g forces on pilot performance.

The University of Connecticut will extend the optimal control model to include the effects of high g forces on pilot performance in an aerial tracking task. Static tracking experiments will be conducted by the University of Connecticut including a study of the effects of gun sight lead computing dynamics. Motion based g-stress experiments will be performed at AMRL using the dynamic environment simulator (DES). The experimental program conducted at the University of Connecticut will concentrate on determining the effects of target motion and visual cues on tracking performance. Air-to-air tracking on the DES will be studied to analyze the interplay between attacker aircraft dynamics and target movement, and to refine the static model.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

6.0004, EVALUATION OF RESEARCH IN LIFE SCIENCES

J.M. Christensen, Wayne State University, School of Liberal Arts, Dept. of Anthropology, *4841 Cass Ave., Detroit, Michigan* 48202 (DF052560; F49620-78-C-0075)

AF function - the AF must be assured that its life sciences program consisting of biomedical and human factors basic research is of the highest obtainable quality, that it relates to critical AF problems, and that the results will be used as rapidly as they become available. Deficiency - no mechanisms are available currently to provide for review of proposals and preparation of research plans that could augment the staff and laboratory reviews that are now relied on for selection of tasks and program guidance. Objective - this task will fill the need for external and independent scientific and technical reviews of research plans and programs by qualified scientists in the nondefense research community. How research contributes - this work effort will fill a gap in AF research evaluation and guidance procedures that previously have been restricted to staff and in-service scientists.

The investigator will provide technical reviews of research proposals by the best qualified civilian scientists. He will also assemble panels for program reviews and workshops to provide research planning evaluation and guidance and he will select and support experts who will prepare reports as needed on research problems in areas of critical interest to the AF.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

6.0005, MODELING OF HUMAN JOINT STRUCTURES

A.E. Engin, Ohio State University, Columbus Campus, School of Engineering, Dept. of Engineering Mechanics, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF323680; F33615-78-C-0510)

This effort is for the purpose of developing and compiling available data on analytical models of human long-bone joints. These efforts will result in the formulation of joint structure algorithms which are to be incorporated into the presently available articulated total body (ATB) model at AMRL. This total development will result in a capability to analytically predict human limb motion during total-body impact exposures such as encountered during ejection from aircraft accelerations, aircraft crashes or escape module ground impact, as well as during body exposures to prescribed windblast forces during ejection into a wind stream.

Analytic models of the long-bone joints of the human body will be formulated. The bony geometric and ligamentous structure of the joints will be included in the models, and the effects of musculature evaluated. Data from previous joint-structure studies will be used and additional modeling performed to provide joint-descriptive computer algorithms for each of the joints. The properties of the analytic joints will be compared to previously gathered data on joint torque vs. orientation properties, and where necessary, additional experimental studies will be performed to validate analytically developed joint models.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Labs.

6.0006, INSTRUCTOR/SIMULATOR INTERFACE DESIGN STUDY

A. Lippay, Canadian Commercial Corp., *Ottawa, Ontario, Canada* (DF228520; F33615-78-C-0006)

To develop and evaluate new design concepts for instructor interface in a flight simulator. The purpose is to provide a method of delineating instructional tasks to support analytic design and evaluation of interface methods, identify advanced methods as candidates for future systems, develop objective techniques for evaluating these methods, and apply the techniques to derive new design concepts for the instructor interface portion of future simulators.

A technique will be developed to delineate instructional tasks in a way which facilitates the design of interface concepts and equipment. Within the delineation framework so developed, a representative instructional task will be defined. A survey of interface methods will be conducted, and methods of promise will be matched with the instructional tasks for which they are best suited. Techniques will be derived for objectively evaluating interface methods and will be applied to several methods identified as best candidates. Results will be applied to develop advanced design concepts for instructor interface. Major milestones - delineation of instructor tasks (4 MAC) survey of interface methods (6 MAC), develop objective ovaluation methods (10 MAC) and develop advanced design concepts (13 MAC).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, THEORETICAL PHYSICS

J.D. Walecka, Stanford University, School of Humanities & Sciences, Dept. of Physics, *Stanford, California* 94305 (PHY77-16188)

This work represents a continuation of that currently supported by Foundation grant PHY75-18444 A01.

Research carried out will be primarily concerned with the quantum theory or many-particle systems, the structure of nuclei using elementary particles as probes, and with theories of the elementary weak, electromagnetic, and strong interactions and their consequences.

At present, specific research projects are under way on the following topics: unified analysis of semi-leptonic weak and elec-

tromagnetic interactions with nuclei, neutrino scattering from nuclei and weak neutral currents, parity violations in electron scattering from nuclei and weak neutral currents, exchange currents in nuclei, photo and electroproduction of mesons from nuclei, high-energy hadron scattering from nuclei and the theory of the optical potential, field theory of highly condensed matter, gauge theories of the elementary interactions, symmetry breaking, quark confinement, classical solutions in quantum field theories, collective excitations of atoms, and the theory of the free-electron laser (in connection with experiments at HEPL).

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0002, LINEAR AND NONLINEAR OPTICAL EFFECTS IN LIQUID CRYSTALS

Y.R. Shen, University of California, Berkeley Campus, School of Engineering, Dept. of Physics, *Berkeley, California* 94720 (DMR78-18826)

Lasers are devices capable of producing extremely high intensity pulses or beams of light. Some lasers can produce pulses so intense that they are capable of melting steel or of other effects called 'second order effects'. Liquid crystals, on the other hand, have extraordinary electrical and optical properties, as evidenced in their use as temperature indicators (a small change in temperature produces a change in color) and as LCD (liquid crystal display) devices (where an electric field changes the optical properties). The thrust of Professor Shen's work is to examine the interaction between the very intense fields generated by laser light and the liquid crystals. The extent of interaction can be subtly varied by changing the temperature of, or static fields appled to, the liquid crystals, facilitating obtaining information on both liquid crystals and the nature of interactions with very intense light.

Research, supported under DMR 76-19843, on linear and nonlinear optical effects in liquid crystals is being continued with a new set of experiments involving stimulated Raman and Brillouin scattering, wavelength dispersion of optical-field-induced ordering, self-focusing in active medium, second harmonic generation, optical-field-induced transitions, and/or alloying effects. The results should give a better understanding of properties of liquid crystals, of the general features of various nonlinear optical effects, of the characteristics of phase transitions, and of impurity and alloying effects on materials.

This is a continuation of work supported by DMR76-19843. It is the first year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0003, BASIC RESEARCH IN PLASMA PHYSICS

N. Rynn, University of California, Irvine Campus, School of Physical Sciences, Dept. of Physics, *Irvine, California* 92664 (PHY78-07816)

This research project will study certain basic properties of hot, full-ionized gasses (plasmas). An experimental and theoretical investigation of turbulent diffusion and transport across a magnetic field is proposed. The experimental program will use an extension of previously developed laser diagnostics to probe the density and the temperature of the plasma both in space and time. The development of the optical diagnostic techniques is discussed in detail. It is also proposed to investigate instabilities caused by anisotropic velocity distributions, parametric decay and excitation of ion cyclotron waves, plasma filamentation and the coherence of modes and 'clump' theory. All of these programs overlap at at least one point.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0004, THEORETICAL STUDY OF SOLITARY-WAVE PHENOMENA IN CONDENSED MATTER (QUASI-ONE-DIMENSIONAL CONDUCTORS)

S.E. Trullinger, University of Southern California, School of Letters Arts & Sciences, Dept. of Physics, *3551 University Ave., Los Angeles, California* 90007 (DMR77-08445)

A theoretical study of solitary-wave phenomena in condensed matter will be carried out. In particular, the theory describing electrically charged solitary waves in quasi-one-dimensional conductors will be developed. Specific problems to be studied will include: (1) The applicability of current theories to materials such as TTF-TCNQ and its relatives. A comparison with available experimental data will be made. (2) The generalization of the solitary-wave theory to apply to the case of the charge-density-wave condensed state at low temperatures. (3) The development of a phenomenological theory which takes into account the interaction between solitary waves on neighboring chains of a quasi-one-dimensional conductor.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0005, CHARGED PARTICLE RESEARCH AT DYNAMITRON AND TANDEM

G.T. Garvey, U.S. Dept. of Energy, Physics Div., *Lemont, Illinois* 60439 (AK-01-01-01-1)

The charged-particle research at the dynamitron is made up of two principal research efforts. The largest is an ongoing investigation into highly-exothermic reactions with light nuclei. The reactions to be studied are selected on the basis of their intrinsic interest to nuclear physics, astrophysics, and their potential use as clean fuel in schemes employing inertially confined plasmas. The other venture is a new undertaking at Argonne wherein the effects of induced weak currents are studied in nuclear beta decay. A small effort in this weak interaction program, involving extensive collaboration, is the investigation of a variety of possibilities to find a suitable case to study DELTA T equals 1 parity mixing which serves as a sensitive test of various forms of the newly discovered neutral weak current. The light-ion research at the Tandem covers a wide variety of topics ranging all the way from a detailed study of the nuclear spectroscopy of the actinides to a new undertaking--the measurement of the DELTA T equals 1 parity mixing between two close lying states in 20Ne. The first program leads to detailed data and hopefully understanding of the structure of the deformed actinides which make up all the presently conceived fission energy sources, while the latter examines the largest piece of the hadron-hadron weak current. Between these two extremes are a large number of topics important to our understanding of nuclear structure.

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0006, DISORDERED SEMICONDUCTORS

H. Fritzsche, University of Chicago, School of Physical Sciences, Dept. of Chemistry, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (DMR77-11683 A01)

The experimental program of research on the properties of defects and localized gap states in amorphous semiconductors previously supported by NSF grant DMR7515003 A01 will be continued. The role of valence alternation defects as luminescence or recombination centers will be studied by altering in a controlled manner their concentration by high-temperature doping and low-temperature drift diffusion of various addititves. Compensation of defects by the method of lithium drifting will be attempted in tetrahedrally coordinated semiconductors as well as in chalcogenide glasses. A new two-beam photoconductivity modulation technique using X-ray excitation together with infrared scanning will be employed to determine the energy distribution of recombination centers. Experiments will be performed to determine the nature of the reversible photostructural centers by means of photo-induced electron spin resonance and photo-induced infrared absorption.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0007, DEVELOPMENT OF MOLECULAR BEAM EPITAXY FOR FABRICATION OF TERNARY SEMICONDUCTOR DEVICES

A.H. Clark, University of Maine, Orono Campus, School of Arts & Sciences, Dept. of Physics, *36 Winslow Hall, Orono, Maine* 04473 (ENG 76-14393)

The ternary semiconductor, CuInSe2, has recently been shown to have significant promise as a photovoltaic material (i.e., solar cells). We are using molecular beam epitaxy to produce high-quality films of this material in order to better understand its basic properties. Solar cells produced by MBE should approach the highest efficiencies attainable in thin film form and will establish a benchmark for other deposition processes which are economically feasible.

SUPPORTED BY U.S. Dept. of Energy

8.0008, EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF INTERACTION OF INTENSE RADIATION WITH ATOMS

S. Ezekiel, Massachusetts Inst. of Technology, School of Engineering, Dept. of Aeronautics & Astronautics, 77 *Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY77-07156 A01)

The near resonant excitation of atomic systems is currently arousing very considerable interest on both the theoretical and the experimental levels. In the case of purely radiative relaxation, field intensity effects provide important verification and elucidation of quantum electrodynamics.

The virtual elimination of Doppler and collisional broadening by the use of atomic beams, along with the development of tunable lasers of high frequency stability and high intensity, have made possible the observation of a great many previously unobserved effects in saturated coherent optics. Extremely high-precision studies of a number of phenomena are proposed for two-level as well as in multi-level atoms. Among these studies are: two-photon absorption, Autler-Turnes effect, coupling of two strongly driven transitions and light scattering from a strongly pumped system.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0009, PRECISION WAVELENGTH MEASUREMENTS USING LASER TECHNIQUES

A. Javan, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, 77 *Massachusetts Ave., Cambridge, Massachusetts* 02139

A scanning Michelson interferometer has been developed and used to compare laser wavelengths with a laser length standard. This wavemeter, which has an accuracy of one part in 10 to the 8th power, is used for high-resolution infrared spectroscopy.

SUPPORTED BY Massachusetts Inst. of Technology

8.0010, A PARAMETRIC STUDY OF THE EMP INTERACTION WITH AN AIRCRAFT OVER A LOSSY GROUND PLANE

T.T. Crow, Mississippi State University, School of Arts & Sciences, Dept. of Physics, *102 Experiment Station Bldg., Mississippi State, Mississippi* 39762 (DF053110; AFOSR-78-3667)

AF function - a number of simulation facilities have been constructed to test the response of aircraft and missiles to the nuclear EMP. In each of the existing facilities the aircraft must rest on a concrete pad which eliminates the possibility of testing the inflight mode response or the tests must be conducted as the aircraft flies by the simulator which in turn presents its own particular difficulties. Opportunity - a theoretical model is needed for the interpretation of the 'fly-by' test data as well as for the extrapolation of the test data from ground based measurements to predict the inflight mode response. Objective - a determination of the aircraft skin current and charge when the aircraft is under illumination of nuclear EMP and in the ground alert mode. Contribution - this work will provide analytic models for the determination of induced skin currents and charges by external electromagnetic pulses.

The dyadic Green's function for a lossy half space will be derived and the Green's function extended to the complex S plane. An SEM representation for the integral functions will be derived aiming toward a numerically efficient means of calculating the dyadic Green's function integral equations for a thin wire horizontal to a lossy half space and for perpendicular crossed wires over a lossy half space will be derived. Next, approximate analytic solutions and numerical solutions will be obtained for the wire currents.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0011, THEORETICAL STUDIES OF ATOMIC COLLISIONS

A. Halpern, City University of New York, Brooklyn College, School of Science, Dept. of Physics, *Bedford Ave. & Ave. H, Brooklyn, New York* 11210 (PHY78-11611)

Research in theoretical atomic physics will be initiated. Topics of interest include investigations of elastic scattering of charged particles by atoms, excitation of atoms and ions by electrons, protons, alpha particles, and other fully stripped atoms, atom-atom and ion-atom collisions, ionizing collisions, Glauber theory, and charge transfer collisions. The calculations are of both formal and practical interest in atomic physics. They will also be relevant to aspects of astrophysics and atmospheric physics, and to the plasma physics aspects of energy production and of nuclear pumped lasers.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0012, ELECTRONIC STATES AT METAL-SEMICONDUCTOR INTERFACES

A.J. Sievers, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Physics, *Ithaca, New York* 14850 (DF053440; AFOSR-77-3684)

AF function - microwave solid state electronic devices are essential elements of Air Force surveillance, electronic countermeasures, and communication systems. Opportunity - little is known about the metal-semiconductor interface electronic states that produce the Schottky barrier and there have been only a few techniques that could study these electronic states. Objective - the objective of this research is to study metal-semiconductor interface states using new IR techniques. How work contributes - this research should provide additional knowledge on the physical nature of interface electronic states that would indicate how these states could best be used in a new generation of submicron electrical and optical devices.

An IR surface electromagnetic wave spectrometer and a Fourier transform ellipsometer will be designed and constructed. The excitation spectrum of the electronic interface states will be examined for metal in contact with both group IV and III-V semiconductors with initial research on Ge-Au and Ge-Ag systems by measuring the surface electromagnetic wave absorption as a function of pressure, temperature, D.C. electric field and magnetic field.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0013, POINT DEFECTS IN IONIC CRYSTALS - ROLE OF THE SURFACE CHARGE

L.M. Slifkin, University of North Carolina, Chapel Hill Campus, Graduate School, Dept. of Physics, *Chapel Hill, North Carolina* 27514 (DMR78-09198)

Surfaces of ionic crystals generally are electrically charged because of an excess of surface kinks of one sign. The compensating ionic space charge has a depth of about 0.1 micron, across which there is a potential difference often of about 0.2 volt. Very large perturbations of concentrations of point defects in this region give rise to a number of interesting and important effects. This phenomenon is being studied in the silver halides, which are attractive media because of the firm groundwork already established (a result of the importance of these effects to the photographic process) and also because the very high ionic conductivity of the space charge layer makes possible experiments not feasible with other materials. The following experiments are performed: (1) Space charge is studied by measuring the conductivity as a function of thickness of evaporated films, and of various adsorbed species. (2) Equilibrium concentrations, at various temperatures, of divalent dopants, are determined as a function of depth below the surfaces of single crystals. (3) An experiment not

involving surface charge phenomena is suggested by the diverse ways in which iodide addition affects the properties of AgCl and AgBr photographic emulsions: elastically bound complexes between I and point defects are to be sought.

This is the first year of a three-year continuing grant.

It is a continuation of work supported by DMR 76-18862.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0014, ATOMIC PROCESSES IN STRONG ELECTROMAGNETIC FIELDS

J.E. Bayfield, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics & Astronomy, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (PHY76-84186 A01)

The physics of atoms and molecules in strong electromagnetic fields is to be broadly investigated using new, sensitive and flexible techniques based upon highly excited atom and negative ion beams in microwave and infrared laser fields. A number of fundamental and unverified theoretical predictions dealing with the nonlinear behavior of gas atoms, negative ions and molecules in intense CO2 laser radiation will be tested. The proposed experiments cover three areas: atomic structure in strong fields, multiphoton ionization and dissociation in strong fields, and radiative-collision processes.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0015, CRITICAL PHENOMENA AND PHASE TRANSITIONS

D.M. Jasnow, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DMR76-19443 A01)

Research previously supported by DMR76-19443.

Theoretical research in condensed matter physics will be carried out. Among the problems to be investigated will be the application of renormalization techniques to non-uniform systems. This will include the evaluation of the order parameter profile between two coexisting phases, in order to examine the nature of the interface separating the phases.

Also, problems in the area of polymer dynamics will be studied. For example, the question of the interplay between 'excluded volume' forces and hydrodynamic interactions will be studied, in order to determine of relaxation time for a polymer in a solvent.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0016, MAGNETIC RESONANCE STUDY OF ATOMIC AND MOLECULAR MOTIONS

D.C. Ailion, Utah Higher Education System, University of Utah, School of Science, Dept. of Physics, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (DMR76-18966 A01)

This research was previously supported under NSF grant DMR-7618966.

Recently developed techniques will make use of nuclear magnetic resonance (NMR) to obtain a microscopic understanding of atomic and molecular magnetic resonance (NMR) to obtain a microscopic understanding of atomic and molecular motions in solids. NMR relaxation time techniques will be applied to the study of ionic diffusion in solid electrolytes such as sodium B'-alumina. Because of the very high conductivity of sodium ions in B and B'-alumina, these substances have a variety of practical applications in problems where energy storage and conversion are important.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0017, INELASTIC ELECTRON AND SOFT X-RAY SPECTROSCOPY

S.E. Schnatterly, University of Virginia, School of Engineering & Applied Science, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (DMR78-16753)

Experimental studies of the electronic structure and excitations in solids which previously were supported by NSF grant DMR-7721709 will be continued. Two research areas will be addressed. The first area is concerned with electron energy loss phenomena in solids. The inelastic electron scattering spectrometer previously built with NSF support will be reassembled with improvements in design at the University of Virginia. Experimental studies of x-ray thresholds, absorption edge fine structure, atomic plasmons and core excitons will be carried out using this technique. An improved understanding of these effects will provide a basis for testing the validity of current theories for single particle and collective excitations in solids. The second area of research is concerned with soft x-ray spectroscopy. An emission spectrometer is being designed and constructed which should have a significant increase in sensitivity over equipment currently available. Experiments using this technique will be carried out to complement the electron scattering experiments. Also, the application of this technique to experimental studies of surface phenomena will be investigated.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0018, SELECTIVE ABSORBER (PHOTO-THERMAL CONVERSION OF SOLAR ENERGY WITH SELECTIVE ABSORBER)

E. Ejder, Lunds Universitet, School of Technology, Inst of Solid State Physics, *Box 725, Lund 7, Sweden* (53 5562 022)

OBJECTIVE: Utilization of solar energy for heating purposes is an attractive method for covering a significant part of the energy demand. The first step in this process is an effective conversion of solar energy to heat energy by a selective absorber, i.e., a surface with good absorption of solar light and low thermal radiation losses.

APPROACH: Physical investigations of semiconductor materials for selectively absorbing surfaces. Evaporated layers will be investigated concerning their optical properties and surface structure. Comparisons will be made between amorphous and crystalline materials.

INTENDED USE OF RESULTS: The results will be useful for manufacturers of solar light absorbers for heating purposes. Improved efficiency of solar light absorbers will be valuable in all systems for solar heating which are now being built and will be built in the future.

SUPPORTED BY Namnden for Energiproduktionforskning

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, THEORETICAL ASTROPHYSICS RESEARCH

P. Goldreich, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astron, *1201 E. California Blvd., Pasadena, California* 91109 (AST78-21453)

Investigations related to a variety of outstanding astrophysical problems will be pursued. These include: The excitation of density waves in galaxies by the potential of a central bar, the evolution of satellite orbits due to resonant tides raised in circumplanetary disks, the dynamics of supersonic turbulence in molecular clouds, the relation between quasar absorption lines and the clustering of galaxies, and the origin of the Kirkwood gaps in the asteroid belt.

This is a continuation of work being done under AST-7624281A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0002, STELLAR STRUCTURE AND EVOLUTION

J.P. Cox, University of Colorado, Boulder Campus, School of Arts & Sciences, Dept. of Physics & Astrophysics, *1200 University Ave., Boulder, Colorado* 80302 (AST77-23182 AO1)

Support is for continuation of studies in basic stellar structure and evolution. The second year of the grant will consider mainly the radial and nonradial stability of stars in various stages of evolution and other kinds of objects, including the sun. Associated investigations will include some effects of rotation.

Some areas of high energy astrophysics will be explored, such as the transport of X-rays in energy and space through circumstellar gas, and properties of X-ray sources in general.

Prior support was by NSF grant AST77-23182.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0003, BINARY STAR SPECKLE INTERFEROMETRY

H.A. McAlister, Georgia State University, Graduate School, *33 Gilmer St. S.E., Atlanta, Georgia* 30303 (AST78-01743)

Support is for a program of binary star speckle interferometry with the 4-meter and 2.1-meter telescopes at Kitt Peak National Observatory to yield diffraction limited measures of the position angles and separations of close binary systems. The program includes spectroscopic, astrometric, spectrum, occultation and close visual binaries as well as stars suspected to be binary by indirect or incomplete evidence. The minimum resolvable separation of 0.03 arc-second with the 4-meter telescope offers a significant increase in sensitivity to new binaries. Observations of spectroscopic and astrometric binaries will permit the determination of new entries into the empirical mass-luminosity relation for stars, of fundamental importance to stellar astrophysics and evolution. Secondary goals include the improvement of existing binary star orbits, new orbits for systems that are difficult or impossible to observe by other techniques, and the search for planetary mass perturbations in the orbits of nearby visual binaries.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, OBSERVATIONAL PROGRAM IN GROUND-BASED INFRARED ASTRONOMY

E. Becklin, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (AST78-09513)

A television guiding system and a chopping secondary mirror modification will be installed on the eighty-eight inch telescope at Mauna Kea, Hawaii. The television guiding system and chopping secondary will be used primarily to make the use of the telescope for observations more efficient. The television system will allow accurate guiding on low surface brightness galaxies. The new chopping secondary mirror modification will increase the signal-to-noise ratio for specific infrared observations.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, NUCLEAR ASTROPHYSICS AND THE ORIGIN OF THE ELEMENTS

D.N. Schramm, University of Chicago, School of Physical Sciences, Dept. of Astronomy & Astrophysics, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (AST78-20402)

This research will be concerned with nuclear astrophysics -- the interaction of nuclear physics and astronomy. Since nuclear reactions provide the energy sources for stars, nuclear astrophysics is associated with stellar evolution. There are also a number of other areas in astrophysics where nuclear reactions play a role, such as the origin of the chemical elements, the origin of cosmic rays, supernovae, and other extremely energetic phenomena such as quasi-stellar objects (quasars).

A major area of the research program will center on the origin of the elements and cosmic rays. Particular attention will be devoted to the latter stages of stellar evolution, gravitational collapse and supernovae explosions. The age and evolution of the elements will be studied. There will be studies related to the origin of the solar system.

Another area of investigation will concern high-energy physics and astrophysics. Both high-energy physics and astrophysics are involved in studies of the weak interaction in gravitational collapse and neutrino emission in stars. Other areas to be investigated include mass loss effects on the evolution of massive stars, constraints on time variation of the gravitational constant, neutrino fluxes from the nuclei of active galaxies and quasars and high-energy solar flares.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, RESEARCH IN NUCLEAR ASTROPHYSICS

J.W. Truran, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Urbana, Illinois* 61801 (AST78-20123)

The research to be carried out in this grant will be primarily concerned with two broad topics in nuclear astrophysics: (1) the mechanisms by which heavy nuclei are formed in stellar interiors, novae, and supernovae, and (2) the consequences of mass accretion onto white dwarf stars in aging binary systems. Detailed calculations have shown that the composition of matter ejected in nova and supernova explosions is consistent with the abundances of material in the solar system. It has also been demonstrated that luminous and rapidly evolving red giant stars are also the formation site of a class of heavy nuclei ranging from the heaviest isotopes of iron through mercury and lead. Nova explosions have been shown to result from the accretion of hydrogen-rich material onto the surfaces of white dwarf stars in binary systems.

Studies which will be carried out include: (1) studies of the hydrodynamics of nova explosions; (2) the accretion of matter onto white dwarf stars; (3) the synthesis of elements in the outer atmosphere of a supernova; (4) the synthesis of elements in the interiors of red giant stars; (5) the formation of dust grains in novae and supernovae; and (6) the behavior of neutron star matter at high temperatures and densities.

This is a continuation of research previously supported under NSF grant AST77-21563.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0007, A HYDRODYNAMIC TREATMENT OF STELLAR CONVECTION

R.G. Deupree, Boston University, Graduate School, *705 Commonwealth Ave., Boston, Massachusetts* 02215 (AST78-10288)

This research will study the relation between convection and pulsation in the classical Cepheid variable stars. The calculations will be performed using a two-dimensional hydrodynamics code successfully used to describe the treatment of convections in RR Lyrae variable stars and to locate the region of pulsational instability for those variables. Such computations for classical Cepheid variables may assist in determining (1) the location of the red edge of the Cepheid instability strip, (2) the existence of nonvariable stars inside the instability strip, and (3) the masses of classical Cepheid variables.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, SOLAR RADIO PROGRAMS AT THE HARVARD RADIO ASTRONOMY STATION

A. Maxwell, Harvard University, Cambridge Campus, Harvard College Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (ATM77-21453)

This grant will support research programs in solar radio astromony to be carried out at the Harvard Radio Astronomy Station, Fort Davis, Texas. The programs are as follows: (1) Investigation of the initial stages of shock waves generated by solar flares, as indicated by radio emission in the form of bursts of spectral type II and the subsequent effects of the shock on the interplanetary medium, as determined by space vehicles such as Solrad and Helios. (2) Study of the relation of solar impulsive bursts in the microwave band, as shown by their dynamic spectra, to bursts of hard x-rays as recorded by equipment on the International Sun-Earth Explorer (ISEE-C), launched in mid-1978. (3) Provision of summaries of solar radio spectral data for international use, by prompt publication in NOAA-EDS Monthly Bulletin of Solar-Geophysical Data; provision of detailed information on solar radio outbursts to individual scientists; maintenance, for

the American time zone, of the 24-hr global watch on the dynamic spectra of solar radio bursts.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0009, RESTORATION OF THE CDC-LUYTEN MEASURING ENGINE

J.W. Warner, University of Minnesota, Minneapolis Campus, School of Liberal Arts, Dept. of Astronomy, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (AST78-07961)

This grant will provide funds to restore the Control Data Corporation-Luyten measuring engine to operating condition in order to test its performance and to determine its potential versatility for other types of astronomical measurement.

The machine consists of a measuring engine, a console with its machine control functions and hardwired computer, and the software programs for final data reduction. Certain parts must be replaced and there will be series of alignment tests. After the initial checkout, several plates will be measured to check out the full reduction procedure. The measuring engine will then be tested for potential use in other astronomical applications.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0010, ULTRAVIOLET AND X-RAY BOMBARDMENT OF PLANETARY ATMOSPHERES

J.A. Samson, University of Nebraska, Lincoln Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *Lincoln, Nebraska* 68508 (ATM78-05702)

The interaction of solar radiation with a planet's atmosphere depends critically upon the wavelength of the incident radiation. The energetic radiation below 2000 A causes dissociation, ionization, and dissociative ionization of atmospheric molecules. The resulting molecular fragments react with ambient species to form a source of new molecules in the atmosphere, while the ionic fragments are the starting species in ionospheric chemistry. The objective of this research is to investigate the interaction of solar ultraviolet radiation with planetary atmospheres and to provide cross sections for specific interactions as a function of wavelength in the interval 100-1400 A. The techniques used in the study include measurement of kinetic energies of ejected photoelectrons (photoelectron spectroscopy) and of ionic species with a mass spectrometer.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0011, PERIOD CHANGES OF ECLIPSING BINARY STARS AND BINARY STAR EVOLUTION

T.J. Herczeg, University of Oklahoma, Norman Campus, School of Arts & Sciences, Dept. of Astronomy, *660 Parrington Oval, Room 101, Norman, Oklahoma* 73069 (AST78-12307)

Support is for a comprehensive study of period changes of eclipsing binary stars, with particular emphasis on the problems of close binary evolution. This investigation, to be carried out by a team of three in a two-year period, will include (1) an extensive survey of the literature to assess available information and (2) a large number of new photometric observations on about 45 selected binary systems of crucial importance. The observational section of the work is to be based essentially on National Observatories, a small photometric telescope at the University of Oklahoma and the coordination of certain programs with the University Observatory in Ankara, Turkey. The plate collection of the University of Oklahoma Observatory will serve as a source of additional information.

The objective of this investigation is to present an encyclopedic summary and critical evaluation of all the useable information concerning the periods of two large classes of objects: W Ursae Majoris binary stars and Algol-type semi-detached binary systems. Reliable information of this type is badly needed to fully utilize the period variations as an important tool in the study of close binary evolution.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0012, THEORETICAL STUDY OF PLASMA FLOW INTERACTIONS WITH PLANETS

P.A. Cloutier, Rice University, Graduate School, Dept. of Space Physics & Astronomy, *6100 Main St., Houston, Texas* 77001 (ATM77-12996 A01)

This grant will support theoretical research on the interaction of flowing plasmas with planetary bodies in continuation of the investigations conducted under previous NSF Grants GA 28033x and DES 74-19668. Work to date under these grants has been directed at an understanding of solar-wind interactions with the atmospheres and ionospheres of non-magnetic or weakly magnetic planets such as Venus and Mars, and has led to formulation of models which appear to explain the general features of the flow of solar wind plasma in the vicinity of these planets. However, a more detailed study will be undertaken to allow predictions of localized atmospheric profiles and structures, including effects of asymmetries in flow patterns, variations in atmospheric parameters with time and geographic location, and especially the effects of photochemistry, diffusion, and thermalization. The major aims of this work are to produce a quantitative model relevant to and an understanding of the PVO physical mechanisms concerning the interaction of the solar wind with planetary atmospheres.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

VOLUME 17 NUMBER 7 / APRIL 8, 1979

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N79-15898*# National Aeronautics and Space Administration, Washington, D. C.
AVIONICS AND CONTROLS RESEARCH AND TECHNOLOGY
Herman A. Rediess, ed. and Duncan E. McIver, ed. 1979 84 p Workshop held at Hampton, Va., 27-28 Jun. 1978
(NASA-CP-2061; L-12498) Avail: NTIS HC A05/MF A01 CSCL 02A

The workshop provided a forum for industry and universities to discuss the state-of-the-art, identify the technology needs and opportunities, and describe the role of NASA in avionics and controls research. Author

N79-15899# Naval Weapons Engineering Support Activity, Washington, D. C.
A PREDICTION OF AVIATION LOGISTICS REQUIREMENTS (PALR) FOR THE DECADE 1985-1995, VOLUME 1
Harry Foster Jun. 1978 100 p refs 2 Vol.
(AD-A060468) Avail: NTIS HC A05/MF A01 CSCL 15/5

The objectives of this study were to (1) develop a basis for forecasting naval aviation logistics requirements for the 1985-1995 decade, (2) identify problems inherent in the logistic support environment of naval aviation that will surface during this time-frame, and (3) make Navy leadership aware of the opportunities that exist in the future to alleviate the problems. Employing widely used technological forecasting techniques e.g. (expert opinions, delphi, scenarios, trend extrapolation, etc.) the study projected 8 to 18 years into the future. Thus, sufficient lead time is provided naval planners for developing efficient and effective systems to support the complex equipment and weapon systems of the near future. PALR has provided (1) a forum for industry and military experts to discuss the future of naval aviation (2) an awareness of existing trends that will exist unless remedies are taken. Author (GRA)

N79-15900# Naval Weapons Engineering Support Activity, Washington, D. C.
A PREDICTION OF AVIATION LOGISTICS REQUIREMENTS (PALR) FOR THE DECADE, VOLUME 2
Harry Foster Jun. 1978 166 p refs
(AD-A060488) Avail: NTIS HC A08/MF A01 CSCL 15/5

Trend and Event Methodology for the PALR Project is defined. In order to estimate the probability of the selected events, a questionnaire was developed. An impact analysis was conducted on the preliminary findings. Interviews for selected personnel were conducted to make improvements in the PALR Project. S.E.S.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N79-15901 Mississippi State Univ., State College.
NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR SUPER-SONIC FLOWS WITH STRONG SHOCKS Ph.D. Thesis
Krishna Devarayalu 1978 99 p
Avail: Univ. Microfilms Order No. 7900144

The numerical solution of the full Navier-Stokes equations for viscous flow with high Mach numbers and a strong detached bow shock is obtained. Two dimensional flows around (1) a circular cylinder, and (2) a circular cylinder with an aftbody in the form of a fairing, were considered. The solution of the compressible N-S equations was accomplished by the method of finite differences. An implicit scheme of solution, the S.O.R., was used with the optimum acceleration parameters determined by trial and error. The tensor notation was used in writing the N-S equations transformed into general curvilinear coordinates. The coordinate system used was a general nonorthogonal curvilinear system with coordinate lines coincident with all boundaries. This coordinate system was numerically generated. The computational domain was limited upstream by a boundary located at a short distance ahead of the bow shock. Dissert. Abstr.

N79-15902*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A STUDY OF CANARD-WING INTERFERENCE USING EXPERIMENTAL PRESSURE DATA AT TRANSONIC SPEEDS
Blair B. Gloss and Karen E. Washburn Jan. 1979 71 p refs
(NASA-TP-1355; L-12491) Avail: NTIS HC A04/MF A01 CSCL 01A

The canard had an exposed area of 28.0 percent of the wing reference area and was located in the chord plane of the wing or in a position 18.5 percent of the wing mean geometric chord above or below the wing chord plane. The canard leading edge sweep was 51.7 deg and the wing leading-edge sweep was 60 deg. The results indicated that the direct canard downwash effects on the wing loading are limited to the forward half of the wing directly behind the canard. The wing leading-edge vortex is located farther forward for the wing in the presence of the canard than for the wing-alone configuration. The wake, from the canard located below the wing chord plane, physically interacts with the wing inboard surface and produces a substantial loss of wing lift. For the Mach number 0.70 case, the presence of the wing increased the loading on the canard for the higher angles of attack. However, at Mach numbers of 0.95 and 1.20, the presence of the wing had the unexpected result of unloading the canard. Author

N79-15903*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A THEORETICAL INVESTIGATION OF FOREBODY SHAPES DESIGNED FOR NATURAL LAMINAR BOUNDARY-LAYER FLOW
Raymond L. Barger Jan. 1979 18 p refs
(NASA-TP-1375; L-12550) Avail: NTIS HC A02/MF A01 CSCL 01A

The design of forebody shapes for natural laminar flow is discussed. For subsonic flow, computed results for three shapes of different fineness ratios indicate that laminar flow can be attained under conditions that approximate those on the forebody of a cruise missile flying at a low altitude at a high subsonic Mach number. For supersonic (Mach 2.00) design, a one-parameter family of hyperbolic arcs was used to generate forebody shapes having a favorable pressure gradient over the forebody length. Computed results for these shapes indicated laminar and transitional flow over the range of Reynolds numbers considered. Author

N79-15904*# General Dynamics/Convair, San Diego, Calif.
CALCULATION OF THE PLANAR SUPERCRITICAL FLOW OVER A NASA SUPERCRITICAL PROFILE
H. Yoshihara and R. Magnus 18 Sep. 1970 11 p refs
(Contract NAS1-9308)
(NASA-CR-111888) Avail: NTIS HC A02/MF A01 CSCL 01A

An unsteady finite difference procedure was used to calculate the steady inviscid flow over an 11% thickness ratio NASA supercritical profile of LWP 505 at M sub infinity = 0.80 and alpha = 0. An attempt is made to include the viscous effects using a modified form of Head's entrainment method to calculate the turbulent boundary layer. The attempt to predict the viscous effects using the compressible form of Head's integral method with a modified auxiliary equation for the form factors was unsatisfactory. Though a reasonably separation bubble was established on the lower surface, a grossly exaggerated displacement effect resulted downstream of the shock on the upper surface. There clearly is substantial further effort required to evolve a satisfactory boundary layer procedure, which must then be coupled in a still unproven manner with the inviscid procedure. G.Y.

N79-15905# Tokyo Univ. (Japan). Dept. of Aeronautics.
A NUMERICAL PREDICTION OF TYPICAL ARTICULATED ROTOR IMPEDANCE
Kanichiro Kato and Takashi Yamane 18 Oct. 1978 20 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in May 1979
Avail: NTIS HC A02/MF A01

Numerical analyses were conducted, for an articulated rotor blade in practical use in order to grasp the typical articulated rotor impedances. Results included the effects on impedances of the variations in trim velocity, collective pitch setting, and blade linear twist. Author

N79-15906*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TRADE STUDIES RELATING TO A LONG RANGE MACH 2.6 SUPERCRUISER
Willard E. Foss, Jr. and Russell B. Sorrells, III Dec. 1978 20 p refs
(NASA-TM-78811) Avail: NTIS HC A02/MF A01 CSCL 01A

A systems study was conducted on an aircraft concept, representative of a supersonic-cruise military aircraft (supercruiser). The study results indicate that supersonic ranges in excess of 4000 n.mi. at a Mach number of 2.62 are possible with a 500 lbf class aircraft. Trade studies, to determine the sensitivity of supersonic range to parameters which would improve maneuverability, indicate that thrust-weight ratios of as much as 0.5 can be used without significantly decreasing supersonic range; however, increasing the thrust-weight ratio to 1.0 decreases the range capability by about 1100 n.mi. The range penalty for increasing the aircraft limit load-factor from 4.0 to 9.0 is about 500 n.mi. The increased fuel volume of several configurations improved the supersonic range capability by about 1200 n.mi. but, due to associated losses in supersonic L/D, had an insignificant effect on the range at a Mach number of 2.62. Author

N79-15907# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
AERODYNAMIC INPUTS FOR PROBLEMS IN AIRCRAFT DYNAMICS, VOLUME 1
1977 356 p refs Proc. of Lectures held on 25-29 Apr. 1977
(VKI-LS-99-Vol-1) Avail: NTIS HC A16/MF A01

Reviewed are methods to estimate aerodynamic forces and moments which act on a aircraft in unsteady motion. For individual titles, see N79-15908 through N79-15913.

N79-15908# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
AN INTRODUCTION TO THE AERODYNAMICS OF FLIGHT DYNAMICS
H. H. B. M. Thomas *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 55 p refs (For primary document see N79-15907 07-02)
Copyright. Avail: NTIS HC A16/MF A01

The solution of problems of flight dynamics requires the aerodynamic forces, which are called in play, to be expressed in a suitable form. In this context a suitable form is one which adequately reflects the nature of the motion being considered and is, at the same time, convenient for the solution of the equations of motion. Formulations in terms of aerodynamic derivatives, and generalizations thereof, are considered. Physical terms are developed for the various motion variables that give rise to forces and moments, which within a linearized framework are expressible as force or moment derivatives, specifically for an airplane. G.G.

N79-15909# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
THE ESTIMATION OF LATERAL-DIRECTIONAL AERODYNAMIC DERIVATIVES AT SUBSONIC SPEEDS
H. H. B. M. Thomas *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 77 p refs (For primary document see N79-15907 07-02)
Copyright. Avail: NTIS HC A16/MF A01

A brief account is given of the theoretical and semi-empirical methods at present available for estimating the aerodynamic derivatives needed in linearized dynamic studies of airplanes. To bring forth the shortcomings of these methods, and the types of problems posed in any attempt to improve upon the present position, various theoretical results are compared and experimental evidence is offered. Comparisons are made between estimated and measured derivatives for two types of airplanes. G.G.

N79-15910# Hawker Siddeley Aviation Ltd., Hatfield (England).
A REVIEW OF METHODS FOR OBTAINING SUBSONIC LONGITUDINAL AERODYNAMIC DERIVATIVES
A. B. Young *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 46 p refs (For primary document ses N79-15907 07-02)
Copyright. Avail: NTIS HC A16/MF A01

The prediction and use of longitudinal aerodynamic derivatives is reviewed with particular emphasis on the practical problems of civil transport aircraft design. It is shown that the depth to which these aerodynamic data are required varies with the design stage of project as do the available methods for deriving the information. The body of data contained in the standard data sheet systems is examined and the deficiencies listed. The technique of wind tunnel testing for obtaining derivatives is also discussed, together with the information to be obtained from rig test and flight testing. Finally, a review of future trends in the prediction of subsonic longitudinal derivatives is made. Author

N79-15911# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
TRANSONIC/SUPERSONIC LONGITUDINAL AERODYNAMIC DERIVATIVES
E. Khaski *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 33 p refs (For primary document see N79-15907 07-02)

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Some methods of predicting longitudinal aerodynamic derivatives are depicted, stressing two conventional calculation methods, one in subcritical subsonic regime (Multhopp Collocation method) and the other in supersonic regime (based on the Evvard method). The influence of flexibility is discussed and the aerodynamic derivatives of some aircraft are obtained in different ways (theory, wind tunnel testing or in flight). G.G.

N79-15912# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

LATERAL-LONGITUDINAL CROSS-COUPLING EFFECTS

J. Sandford *In its* Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 29 p refs (For primary document see N79-15907 07-02)

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The conditions under which the equations of motion for an aircraft can be separated into lateral and longitudinal groups are first established. The various ways in which these conditions can be violated are then discussed with particular reference to those which are aerodynamic in origin. G.G.

N79-15913# British Aircraft Corp., Preston (England).

TRANSONIC/SUPERSONIC LATERAL AERODYNAMIC DERIVATIVES

B. R. A. Burns and K. Carr *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 1 1977 102 p refs (For primary document see N79-15907 07-02)

Copyright. Avail: NTIS HC A16/MF A01

Estimates of the derivatives due to sideslip, due to rate of roll and yaw, and due to lateral controls, are presented and compared with wind tunnel results and flight data at transonic and supersonic speeds. Some shortcomings and deficiencies in the data sheet methods are identified. Where discrepancies between estimates and measurements are evident, explanations are offered. In most cases these are due to interference effects between adjacent stabilizing and lifting surfaces, which are not accounted for in the based theories. The more important effects of aeroelastic distortion are described briefly and methods of application are illustrated. G.G.

N79-15914# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

AERODYNAMIC INPUTS FOR PROBLEMS IN AIRCRAFT DYNAMICS, VOLUME 2

1977 389 p refs Proc. of lectures held on 25-29 Apr. 1977 2 Vol.

(VKI-LS-99-Vol-2) Avail: NTIS HC A17/MF A01

A series of lectures are presented on ways of analyzing and utilizing aerodynamic characteristics for solving problems related to aircraft stability. For individual titles, see N79-15915 through N79-15918.

N79-15915# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).

PREDICTION OF UNSTEADY AERODYNAMIC FORCES IN HIGH FREQUENCY OSCILLATORY FLOW

H. Foersching *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 2 1977 80 p refs (For primary document see N79-15914 07-02)

Copyright. Avail: NTIS HC A17/MF A01

A review is made of current advances in the development of analytical methods and related computation techniques for the prediction of the motion-induced unsteady aerodynamic inputs for problems in high-frequency aircraft dynamics. The practical applicability and reliability of the various methods is demonstrated and some topics for further research work are indicated. Author

N79-15916# National Aerospace Lab., Amsterdam (Netherlands).

THE USE OF PANEL METHODS WITH A VIEW TO PROBLEMS IN AIRCRAFT DYNAMICS

T. E. Labrujere, R. Roos, and L. J. J. Erkelens *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 2 1977 140 p refs (For primary document see N79-15914 07-02)

(NLR-MP-77009-U) Copyright. Avail: NTIS HC A17/MF A01

A survey is given of the basic principles of the panel methods. The most frequently used methods, steady as well as unsteady, are described in some detail. Recent developments aiming at improvement and extension of the range of applicability are reviewed. The use of panel methods for the determination of stability derivatives is discussed. Results of some applications are shown illustrating the capability of the panel methods.

Author

N79-15917*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AERODYNAMIC CHARACTERISTICS AT HIGH ANGLES OF ATTACK

J. R. Chambers *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 2 1977 39 p refs (For primary document see N79-15914 07-02)

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An overview is presented of the aerodynamic inputs required for analysis of flight dynamics in the high-angle-of-attack regime wherein large-disturbance, nonlinear effects predominate. An outline of the presentation is presented. The discussion includes: (1) some important fundamental phenomena which determine to a large extent the aerodynamic characteristics of airplanes at high angles of attack; (2) static and dynamic aerodynamic characteristics near the stall; (3) aerodynamics of the spin; (4) test techniques used in stall/spin studies; (5) applications of aerodynamic data to problems in flight dynamics in the stall/spin area; and (6) the outlook for future research in the area. L.S.

N79-15918# National Aeronautical Establishment, Ottawa (Ontario).

DYNAMIC STABILITY TESTING IN WIND TUNNELS

K. J. Orlik-Rueckemann *In* Von Karman Inst. for Fluid Dyn. Aerodyn. Inputs for Probl. in Aircraft Dyn., Vol. 2 1977 126 p refs (For primary document see N79-15914 07-02)

Copyright. Avail: NTIS HC A17/MF A01

A comprehensive review is presented of the methods and techniques that are used for wind-tunnel measurements of the dynamic stability parameters of an aircraft. The review is illustrated by numerous examples of experimental equipment available today in various aerospace laboratories in Canada, the United States, and in some European countries. Author

N79-15919# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

ON THE APPLICATION OF CERTAIN STATISTICAL METHODS TO WIND-TUNNEL TESTING

J. McKie London Aeron. Res. Council 1978 57 p refs Supersedes RAE-TR-75018; ARC-36049

(ARC-CP-1390; BR63387; RAE-TR-75018; ARC-36049) Avail: NTIS HC A04/MF A01; HMSO £ 3; PHI

The use of some standard statistical techniques in wind-tunnel testing is illustrated. The results of non-linear regression analysis are applied to the particular problem of comparing the data from experiments in two different tunnels on the same model. Residual variance was used as a measure of the repeatability of results and standard tests were applied to look for significant differences between the two tunnels. The accuracy of a measured aerodynamic coefficient was put in terms of confidence limits for a given probability level. A method is given for determining the minimum detectable effect of a model geometry change and also for finding the number of data points needed to measure a coefficient to a prescribed accuracy. G.G.

N79-15920# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

NON-CONICAL FLOW PAST SLENDER WINGS WITH LEADING EDGE VORTEX SHEETS

R. W. Clark London Aeron. Res. Council 1978 55 p refs Supersedes RAE-TR-76037; ARC-36863

(ARC-R/M-3814; RAE-TR-76037; ARC-36863; BR64192) Avail: NTIS HC A04/MF A01; HMSO £ 5; PHI

The vortex sheet model of leading edge separation which has been successfully applied to slender delta wings of conical shape is extended to nonconical wings which have thin, uncambered cross sections. Calculations of the shape and strength of the vortex sheet are presented for examples of a plane wing with a curved leading edge and of a delta wing with lengthwise camber. In each case it is found that the sign of the circulation shed from the leading edge changes as the calculation proceeds downstream, but the consequences are very different in the two

cases. An experimental investigation to clarify the behavior of the cambered wing is described. J.M.S.

N79-15921# Engineering Sciences Data Unit, London (England).
ANALYSIS OF THE ZERO-LIFT WAVE DRAG MEASURED ON DELTA WINGS
J. Weber and C. King London Aeron. Res. Council 1978 79 p refs Supersedes RAE-TR-76072; ARC-37297 Prepared for RAE Sponsored by Min. of Defence
(ARC-R/M-3818; BR63386; RAE-TR-76072; ARC-37297) Copyright. Avail: NTIS HC A05/MF A01; HMSO £ 6; PHI

Lift and drag were measured by strain gage balance at Mach numbers between 1.4 and 2.8. On some of the wings' surface pressure distributions were also measured. The zero-lift wave drag was examined, as well as skin friction drag and lift-dependent drag. The wave drag was obtained by integrating the pressure distribution. Values of the wave drag were also derived from the measured total drag by subtracting estimated values for the skin friction drag and for the effect of the sting support. The experimental values were compared with one another and with the theoretical estimates derived by supersonic area rule. The different experimental values are shown to be self-consistent and to lie up to 30% below the theoretical estimates. J.A.M.

N79-15922# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
ON THE EVALUATION OF WALL INTERFERENCE IN TWO-DIMENSIONAL VENTILATED WIND TUNNELS BY SUBSONIC LINEAR THEORY
D. Catherall London Aeron. Res. Council 1978 49 p refs Supersedes RAE-TR-76134; ARC-37409
(ARC-R/M-3819; BR63623; RAE-TR-76134; ARC-37409) Avail: NTIS HC A03/MF A01; HMSO £ 5; PHI

The interference potentials for lift, solid blockage and wake blockage were previously presented in the form of integral expressions. The expression for wake blockage is corrected and the integral expressions are converted into power series. The motivation was to provide far-field boundary conditions, especially at large distances downstream, for computations of transonic flows within wind tunnels. Additionally, these power series facilitate the calculation of the interference in the neighborhood of the model. The effects of parametric variations of wall porosity and slot geometry are demonstrated. Lift and blockage interference velocities, their streamwise gradients, and wall conditions for zero solid blockage are presented in both tabular and graphical form. G.G.

N79-15923# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
VORTEX SHEDDING OF A CIRCULAR CYLINDER IN GROUND EFFECT
A. Vitale Feb. 1978 63 p refs
(VKI-TN-124) Avail: NTIS HC A04/MF A01

An experimental analysis was carried out, concerning the behavior of the vortical wake created by a circular cylinder placed in a boundary layer. Both laminar and turbulent boundary layers have been considered. The results obtained have been analyzed in comparison with those of the cylinder placed in a uniform stream. J.A.M.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N79-15924# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORTS: BRIEF FORMAT, US CIVIL AVIATION, ISSUE NO. 1 OF 1978 ACCIDENTS
6 Oct. 1978 506 p
(NTSB-BA-78-7) Avail: NTIS HC A22/MF A01

The 900 general aviation accidents contained in this publication represent a random selection. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors. G.G.

N79-15925# National Transportation Safety Board, Washington, D. C.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA: US GENERAL AVIATION, CALENDAR YEAR 1977
16 Nov. 1978 215 p
Avail: NTIS HC A10/MF A01

This record of aircraft accidents which occurred in U.S. general aviation operations includes an analysis of accident data relating to an overview, types of accidents, accident causal factors, kinds of flying, and conclusions. A statistical compilation of accident information is presented in the form of accident and rate tables, analytic tables, injury tables and cause/factor tables. These statistical data are divided into sections pertaining to all operations, small fixed-wing aircraft, large fixed-wing aircraft, rotorcraft, gliders, and collisions between aircraft. In 1977, there were 4,286 total general aviation accidents, 702 of which were fatal. Included in the total number of accidents are 51 collisions between aircraft. By coding each aircraft involved in collisions, an additional 51 records were produced, which brought the total number of accident records to 4,337. This figure reflects the actual number of pilots and aircraft involved in the accidents.
Author

N79-15926# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORTS: BRIEF FORMAT US CIVIL AVIATION ISSUE NUMBER 5 - 1976 ACCIDENTS
18 Oct. 1977 329 p
(NTSB-BA-77-3) Avail: NTIS HC A15/MF A01

Selected aircraft accident reports, occurring in U.S. civil aviation operations during calendar year 1976, are presented. The 533 general aviation accidents and 6 air carrier accidents contained in this publication represent a random selection. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors. G.G.

N79-15927# Gellman Research Associates, Inc., Jenkintown, Pa.
LARGE CARGO AIRCRAFT: A TECHNOLOGY ASSESSMENT, VOLUME 1 Final Report
Jan. 1978 349 p refs 2 Vol.
(Contract NSF C-2062; Grant NSF ERS-76-80328)
(PB-286896/6; NSF/RA-780240) Avail: NTIS HC A15/MF A01 CSCL 01C

A preliminary comprehensive technology assessment of a future transportation technology, a large cargo aircraft described as having the same capacity as two dedicated Boeing 747 freighters is presented. The methodology and the basic assumptions employed in the conduct of the study and the theoretical basis for the causal model are presented. The differences between the effects which emanate from the operation of the large cargo aircraft and from its function, are indicated. The future state of the world economy is examined. The causal model and the generic effects are presented. Tables, figures, and matrices are included to illustrate areas of impact. GRA

N79-15928# Gellman Research Associates, Inc., Jenkintown, Pa.
LARGE CARGO AIRCRAFT: A TECHNOLOGY ASSESSMENT, VOLUME 2 Final Report
Jan. 1978 298 p refs 2 Vol.
(Contract NSF C-1061; Grant NSF ERS-76-80328)
(PB-286897/4; NSF/RA-780241) Avail: NTIS HC A09/MF A01 CSCL 01C

A principal result of operating a large cargo aircraft (LCA) fleet is stated to be the opening of new channels for international trade. Primary impacts are likely to affect the export sectors of the economies of United States trading partners, particularly

among the developing nations. The possible effects of the LCA are analyzed by reviewing the current patterns of international trade and, then, the potential trade patterns of the future. Since the impact of the LCA is expected to be greater in the lesser developed countries, at least one country was selected as a case study from each major region of developing nations following established criteria. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N79-15929# Defence Research Information Centre, Orpington (England).
DOPPLER LOGS: OPERATION AND APPLICATION
Ingo Harre Apr. 1978 11 p Transl. into ENGLISH from Schiff u. Hafen (Uetersen), v. 29, no. 8, 1977 p 736-739
(DRIC-TRANS-5274; BR61498) Avail: NTIS HC A02/MF A01

Sonar Doppler logs make use of the acoustic Doppler effect to determine the ship's speed. They have the advantage that they can measure the ship's speed over the ground down to a specific limiting depth. At greater depths, measurement is made against a water layer at a specific depth (volume echo mode of operation). The latter is located beyond the boundary layer of the ship, so that sonar Doppler logs are also superior to the traditional logs for measuring the relative ship's speed. The mode of operation of sonar Doppler logs is described. G.G.

N79-15930# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.
OMEGA AND VLF AIRCRAFT INSTALLATIONS
H. G. Hill, J. Kilvington, and N. J. Carter Feb. 1978 44 p refs
(RAE-TM-RAD-NAV-66; BR62457) Avail: NTIS HC A03/MF A01

The successful operation of OMEGA and VLF installations in aircraft is considered. Included is a list of interference field strengths found in various RAE aircraft, the considerations to be taken into account in the choice of aerial type and site, and installation problems and their relation to receiver design. G.G.

N79-15931# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.
VOTRACK: AN UP-TO-DATE DESCRIPTION
J. W. Robertson Feb. 1979 7 p ref
(RAE-TM-RAD-NAV-73; BR62022) Avail: NTIS HC A02/MF A01

The operation of the latest Votrack design is described. The Votrack is a voice operated switch which adjusts its threshold level to suit the level of acoustic noise being picked up by the microphone. The latest device is a great improvement in that the recovery from a latched-up condition was made automatic. G.G.

N79-15932# Centre National d'Etudes Spatiales, Toulouse (France).
HIGH ACCURACY OFF-SHORE POSITION FINDING USING THE GEOLE SATELLITE BASED SYSTEM
Jean-Claude Husson and Jean Saint-Etienne Apr. 1977 16 p Avail: NTIS HC A02/MF A01

Market studies conducted in 1971 and 1974 show that the number of potential users for high-precision position-fixing systems (i.e. ones offering an open sea accuracy of 100 to 200 m) was limited. The total number of ships requiring such services in the early 1990's can be estimated at 400. These ships will be highly specialized and well equipped; on board equipment will clearly include sophisticated dead reckoning systems (Doppler sonar, inertial unit, etc.) and computers. The GEOLE was designed as a means of periodically updating dead reckoning calculations performed onboard ships. To provide updating every 2 hours would require 4 satellites, each weighing 250 kg. These would be placed in orbits at an altitude of 1500 km inclined at 75 deg to the equator, with the four ascending nodes separated from one another by 45 deg of longitude. J.A.M.

N79-15933# Artec, Inc., Columbia, Md.
SAINT LAWRENCE SEAWAY NAVIGATION-AID SYSTEM STUDY. VOLUME 1: TEXT AND APPENDIXES A AND D Final Report, Aug. 1977 - Sep. 1978
Jack W. Lewis and John J. Nelka Sep. 1978 116 p refs 3 Vol.
(Contract DOT-TSC-1395)
(PB-287377/6; DOT-TSC-SLSDC-78-1-1-Vol-1; DOT-SLS-63-78-1-1-Vol-1) Avail: NTIS HC A06/MF A01; also available in set of 3 reports HC E09 as PB-287376-SET CSCL 13J

The requirements for a navigation guidance system which will effect an increase in the ship processing capacity of the Saint Lawrence Seaway (Lake Ontario to Montreal, Quebec) are developed. The requirements include a specification of system positioning accuracy and the type and frequency of information which must be displayed to the master of each ship in the Seaway. A detailed development of the logic used to compute Seaway capacity as a function of the guidance system positioning accuracy is presented. A computer program is given which follows this logic and is used to compute Seaway capacity as a function of positioning accuracy for two classes of ships. Various sensitivity analyses are presented. It is shown that the capacity of the Seaway could be increased by up to 30 percent through the use of a navigation guidance system. GRA

N79-15934# Artec, Inc., Columbia, Md.
SAINT LAWRENCE SEAWAY NAVIGATION-AID SYSTEM STUDY. VOLUME 2, APPENDIX B: USER'S MANUAL AND DOCUMENTATION OF SEAWAY CAPACITY AND CAPACITY ANALYSIS PROGRAMS Final Report, Aug. 1977 - Sep. 1978
Jack W. Lewis and John J. Nelka Sep. 1978 132 p refs 3 Vol.
(Contract DOT-TSC-1395)
(PB-287378/4; DOT-TSC-SLSDC-1-2-Vol-2; DOT-SLS-63-78-1-2-Vol-2) Avail: NTIS HC A07/MF A01; also available in set of 3 reports HC E09 as PB-287376-SET CSCL 13J

A seaway capacity model was developed to determine the navigational guidance system requirements that allow improvement in the capacity of the St. Lawrence seaway. Program AWCAP (all weather capacity) computes the capacity for using visual, and visual plus electronic navigation. The analysis of the capacity results is provided by program ANAWCAP. Flow charts are included. F.O.S.

N79-15935# Artec, Inc., Columbia, Md.
SAINT LAWRENCE SEAWAY NAVIGATION-AID SYSTEM STUDY. VOLUME 3, APPENDIX C: USER'S MANUAL AND DOCUMENTATION OF THE SHIP MANEUVERING REQUIREMENTS COMPUTER PROGRAM Final Report
Jack W. Lewis Sep. 1978 111 p refs 3 Vol.
(Contract DOT-TSC-1395)
(PB-287379/2; DOT/TSC/SLSDC-78-1-3; DOT/SLS-63-78-1-3-Vol-3) Avail: NTIS HC A06/MF A01; also available in set of 3 reports HC E09 as PB-287376-SET CSCL 13J

A ship maneuvering simulation computer program (MANVER) was developed to determine the navigational guidance system performance requirements. A description, structure, performance, data base, input, processing, and output of MANVER are presented. Flow charts and listings of the program are included. F.O.S.

N79-15936# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.
STATUS OF THE FEDERAL AVIATION ADMINISTRATION'S MICROWAVE LANDING SYSTEM
19 Oct. 1978 53 p
(PB-287275/2; PSAD-78-149) Avail: NTIS HC A04/MF A01 CSCL 17G

The Federal Aviation Administration's new common civil/military microwave landing system is about 5 years behind schedule and research and development will cost between $182 to $192 million--approximately $90 to $100 million more than originally estimated. Large amounts of money are still being invested for ground equipment for the existing system. Recognizing these continued investments, along with the probable extension to 1995 of instrument landing systems at international airports, existing instrument landing systems at U.S. domestic airports should be continued in accordance with a mutually agreeable microwave landing system implementation plan. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N79-15937 Kansas Univ., Lawrence.

DESIGN AND DEVELOPMENT OF A SYSTEM TO MEASURE THE MODE SHAPES OF A VIBRATING, ROTATING HELICOPTER BLADE IN A VACUUM Ph.D. Thesis

Frank John Fronczak 1978 423 p

Avail: Univ. Microfilms Order No. 7924860

A photographic technique and equipment are described. Two camera systems are described. One uses cylindrical lenses and a baffling arrangement to take photographs of a line on an object. The other camera uses conventional spherical lenses to photograph the rotor blade. These photographs provide data which is reduced to yield the components of vibration of a full size helicopter blade vibrating at resonance. The rotor test stand, which rotates and excites the blade vibration is described. The mode shapes were measured in a vacuum in order to eliminate aerodynamic forces. Blade deflection data is tabulated and plotted for several rotational speeds and frequencies. Dissert. Abstr.

N79-15938*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EXPERIMENTAL INVESTIGATION OF EFFECTS OF BLADE TIP GEOMETRY ON LOADS AND PERFORMANCE FOR AN ARTICULATED ROTOR SYSTEM

William H. Weller (Army Aviation Research and Development Command, St. Louis, Mo.) Jan. 1979 79 p refs

(DA Proj. 1L2-62209-AH-76)

(NASA-TP-1303; L-12153; AVRADCOM-TR-78-53) Avail: NTIS HC A05/MF A01 CSCL 01C

Wind-tunnel tests of an aeroelastically designed helicopter rotor model were carried out to determine the effects on dynamic response and aerodynamic performance of varying the design of the outboard 8 percent of the blade lengths. Four different blade tip geometries or shapes having different amounts of planform sweep, thickness and chordwise taper, and anhedral angle were studied. Each configuration was tested at several shaft angles of attack for advance ratios of 0.20, 0.30, 0.35, and 0.40. For each combination of shaft angle and advance ratio, rotor lift was varied over a wide range to include high lift conditions.

Author

N79-15939*# Lockheed-California Co., Burbank.

CONFIGURATION DEVELOPMENT STUDY OF THE X-24C HYPERSONIC RESEARCH AIRPLANE, PHASE 1 Contractor Report, Nov. 1975 - Mar. 1976

Henry G. Combs et al Dec. 1976 368 p refs

(Contract NAS1-14222)

(NASA-CR-145032; SP-4499) Avail: NTIS HC A16/MF A01 CSCL 01C

Four hypersonic research airplane configurations found to be the most cost effective were selected for further refinement. The selection was based on a systematic analysis and evaluation of realistic designs, involving nine different configurations, evolving from three different structural/thermal concepts, coupled with existing rocket and sustainer engines. All configurations were constrained by the mission profiles, research requirements, aerodynamic envelope and maximum launch weight established by NASA. J.A.M.

N79-15940*# Lockheed-California Co., Burbank. Advanced Development Projects.

CONFIGURATION DEVELOPMENT STUDY OF THE X-24C HYPERSONIC RESEARCH AIRPLANE Executive Summary, Apr. - May 1976

Henry G. Combs, D. H. Campbell, M. D. Cassidy, C. D. Sumpter, E. Seitz, B. J. Kachel, R. P. James, J. Walters, J. Love, and R. T. Passon Oct. 1977 54 p

(Contract NAS1-14222)

(NASA-CR-145274) Avail: NTIS HC A04/MF A01 CSCL 01C

Bottom line results were made of a three-phase study to determine the feasibility of designing, building, and operating, and maintaining an air-launched high performance aircraft capable of cruising at speeds up to Mach 8 for short durations. The results show that Lockalloy heat-sink structure affords the capability for a 'work-horse' vehicle which can serve as an excellent platform for this research. It was further concluded that the performance of a blended wing body configuration surpassed that of a lifting body design for typical X-24C missions. The cost of a two vehicle program, less engines, B-52 modification and contractor support after delivery, can be kept within $70M (in Jan. 1976 dollars). A.R.H.

N79-15941*# Old Dominion Univ. Research Foundation, Norfolk, Va.

EXPERIMENTAL INVESTIGATION OF EFFECTS OF JET DECAY RATE ON JET-INDUCED PRESSURES ON A FLAT PLATE: TABULATED DATA

John M. Kuhlman, Don S. Ousterhout, and Ronald W. Warcup Nov. 1978 157 p

(Grant NGL-47-003-039)

(NASA-CR-158990) Avail: NTIS HC A08/MF A01 CSCL 01C

Tabular data are presented for an experimental study of the effects of jet decay rate on the jet-induced pressure distribution on a flat plate for a single jet issuing at right angle to the flat plate into a uniform crossflow. The data are presented in four sections: (1) presents the static nozzle calibration data; (2) lists the plate surface static pressure data and integrated loads; (3) lists the jet centerline trajectory data; and (4) lists the centerline dynamic pressure data. Author

N79-15942*# Boeing Commercial Airplane Co., Seattle, Wash. BCAC Preliminary Design Dept.

EVALUATION OF LAMINAR FLOW CONTROL SYSTEM CONCEPTS FOR SUBSONIC COMMERCIAL TRANSPORT AIRCRAFT Final Report, Sep. 1976 - Sep. 1978

Dec. 1978 269 p refs

(Contract NAS1-14630)

(NASA-CR-158976; D6-47109) Avail: NTIS HC A12/MF A01 CSCL 01C

A two-year study conducted to establish a basis for industry decisions on the application of laminar flow control (LFC) to future commercial transports was presented. Areas of investigation included: (1) mission definition and baseline selection; (2) concepts evaluations; and (3) LFC transport configuration selection and component design. The development and evaluation of competing design concepts was conducted in the areas of aerodynamics, structures and materials, and systems. The results of supporting wind tunnel and laboratory testing on a full-scale LFC wing panel, suction surface opening concepts and structural samples were included. A final LFC transport was configured in incorporating the results of concept evaluation studies and potential performance improvements were assessed. Remaining problems together with recommendations for future research are discussed. A.R.H.

N79-15943*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.

FLIGHT TEST EVALUATION OF PREDICTED LIGHT AIRCRAFT DRAG, PERFORMANCE, AND STABILITY

Frederick O. Smetana and Stan R. Fox 1979 781 p refs

(Grant NsG-1077)

(NASA-CR-158076) Avail: NTIS HC A99/MF A01 CSCL 01C

A technique was developed which permits simultaneous extraction of complete lift, drag, and thrust power curves from time histories of a single aircraft maneuver such as a pullup (from V sub max to V sub stall) and pushover (to sub V max for level flight.) The technique is an extension to non-linear equations of motion of the parameter identification methods of Iliff and Taylor and includes provisions for internal data compatibility improvement as well. The technique was show to be capable of correcting random errors in the most sensitive data channel and yielding highly accurate results. This technique was applied to flight data taken on the ATLIT aircraft. The drag and power values obtained from the initial least squares estimate are about 15% less than the 'true' values. If one takes into account the rather dirty wing and fuselage existing at the time of the tests, however, the predictions are reasonably accurate. The steady state lift measurements agree well with the extracted values only for small values of alpha. The predicted value of the lift at alpha = 0 is about 33% below that found in steady state tests while the predicted lift slope is 13% below the steady state value. Author

N79-15944# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

REMOTELY PILOTED VEHICLES - AERODYNAMICS AND RELATED TOPICS, VOLUME 1

1977 231 p refs Proc. of Lectures held on 23-27 May, 1977 2 Vol.

(VKI-LS-101-Vol-1) Copyright. Avail: NTIS HC A11/MF A01

The design of various remotely piloted vehicles (RPV) is discussed, along with ground support equipment. Wind tunnel tests subjecting RPV models to turbulence are reviewed. The communication problem when using several RPV is also considered. For individual titles, see N79-15945 through N79-15948.

N79-15945# Lockheed Missiles and Space Co., Palo Alto, Calif.

[INTRODUCTION TO, GROUND STATION SYSTEMS OF, AND CIVIL APPLICATIONS OF REMOTELY PILOTED VEHICLES]

S. J. Colby *In* Von Karman Inst. for Fluid Dyn. RPV's - Aerodyn. and Related Topics, Vol. 1 1977 89 p refs (For primary document see N79-15944 07-05)

Copyright. Avail: NTIS HC A11/MF A01

If a remotely piloted vehicle system is to perform useful missions, the seven major subsystems must be designed as a well integrated set of complimentary hardware and software. The subsystems are: (1) ground station, (2) data links, (3) air vehicle, (4) avionics and navigation, (5) multiple sensors, (6) launch and recovery, and (7) age and logistics support. The RPV system is intended to perform many functions of observation, information gathering, battlefield firepower support, and electronic warfare where there is a human operator controlling the RPV's behavior and mission equipment from a remote location. J.A.M.

N79-15946# British Aircraft Corp. (Operating) Ltd., Bristol (England). Guided Weapons Div.

AN RPV DESIGN STUDY

P. Swan *In* Von Karman Inst. for Fluid Dyn. RPV's - Aerodyn. and Related Topics, Vol. 1 1977 31 p (For primary document see N79-15944 07-05)

Copyright. Avail: NTIS HC A11/MF A01

The vehicle carried a payload of 10kg and has a payload capacity of 0.1 cu meters. The nose was to be kept clean as planned systems included T.V. cameras and other sensors. The aim was to avoid an oil film over any of the payload area. Maximum speeds of over 40 m/s (80 knots) were desired. The vehicle should be able to fly as slowly as 25 m/s (50 knots). This resulted from early control equipment, which was limited to roughly 1 km range. This in turn limited the effective straight & level runs to 500 m. A level flight time of about 10 seconds was needed to analyze the consequences of any maneuvers. Endurances of 1 hour or greater were planned with a maximum operating altitude of about 3 km, after an improved control system was commissioned. It was intended to catapult launch the vehicle. However, the first flight trials were made using a fixed undercarriage. J.A.M.

N79-15947# British Aircraft Corp. (Operating) Ltd., Bristol (England).

AERODYNAMICS

P. Swan *In* Von Karman Inst. for Fluid Dyn. RPV's - Aerodyn. and Related Topics, Vol. 1 1977 44 p (For primary document see N79-15944 07-05)

Copyright. Avail: NTIS HC A11/MF A01

An item that was checked with some care was downwash on both tail-controlled RPV's and a canard design. It was suspected at one stage, before any wind tunnel testing, that downwash (and upwash) may be subject to viscous damping at low speeds. The genuine cause of the problem turned out to be an incidence range restriction affecting control response. By implication, if downwash and upwash were confirmed as independent of Reynolds Number, the other induced effects, such as loading patterns, must be reasonable. This was also confirmed by the stall pattern on devices that were tunnel-tested. J.A.M.

N79-15948# British Aircraft Corp. (Operating) Ltd., Bristol (England).

PERFORMANCE

P. Swan *In* Von Karman Inst. for Fluid Dyn. RPV's - Aerodyn. and Related Topics, Vol. 1 1977 52 p (For primary document see N79-15944 07-05)

Copyright. Avail: NTIS HC A11/MF A01

The performance of RPV's was split into three groups. Two of these groups were similar in size, performance and possibly cost to an aircraft. The third group, the mini-RPV's was probably the most likely group to be widely accepted. It also suffered most from wind level and turbulence. These problems have solutions but need good control systems to overcome them. Should mini-RPV's be used in large numbers their communications will pose considerable problems, easily saturating the available frequency spaces. Obviously they must be time-multiplexed so that the operator can handle more than 1 machine. This means that the vehicle must fly itself in communications down time. The greater the number of mini-RPV's the longer will be the down time. Extrapolating this to the limit, a mini-RPV becomes indistinguishable from a fire and forget missile. J.A.M.

N79-15949# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

REMOTELY PILOTED VEHICLES - AERODYNAMICS AND RELATED TOPICS, VOLUME 2

1977 271 p refs Proc. of Lectures held on 23-27 May, 1977 2 Vol.

(VKI-LS-101-Vol-2) Avail: NTIS HC A12/MF A01

The propulsion, launching, and recovery of fixed-wing remotely piloted vehicles are discussed as well as the effectiveness of totally integrated systems for aerial reconnaissance and other military applications. Topics covered include computerized simulation, telemetry, data processing and control. For individual titles, see N79-15950 through N79-15953.

N79-15950# British Aircraft Corp. (Operating) Ltd., Bristol (England). Guided Weapons Div.

PROPULSION

R. Stephenson *In* Von Karman Inst. for Fluid Dyn. RPV's-Aerodyn. and Related Topics, Vol. 2 1977 57 p refs (For primary document see N79-15949 07-05)

Copyright. Avail: NTIS HC A12/MF A01

The use of internal combustion engines in MINI-(RPV's), of turbojet engines in MIDI-and MAXI-RPV's, and of solid propellant and liquid propellant rocket engines, and hybrid motors in battlefield reconnaissance drones is described. Alternative power plants considered include ramjet, pulsejet, and pressurejet engines. Future applications of electric propulsion and solar cell propulsion are assessed. A.R.H.

N79-15951# British Aircraft Corp. (Operating) Ltd., Bristol (England). Guided Weapons Div.

LAUNCH AND RECOVERY

R. Stephenson *In* Von Karman Inst. for Fluid Dyn. RPV's-Aerodyn. and Related Topics, Vol. 2 1977 62 p refs (For primary document see N79-15949 07-05)

Copyright. Avail: NTIS HC A12/MF A01

The dynamics of conventional takeoff and landing phases of flight are reviewed and related to the requirements of a fixed-wing

mini-RPV. Alternative methods of launch and recovery which are more relevant to military operational conditions are considered such as zero length and catapult launching. Topics covered include air launch; recovery, recoverable versus expendable RPV's; parachutes; parawings; mid-air retrieval systems; and arrester hooks and net systems. Favored methods of launch for mobile ground use are catapult with stretched rubber cords for launch weights up to 20 kg; pneumatic catapult for launch weights from 20 kg to 50 kg, and zero or near zero length launcher with solid propellant cast motor. Vertical takeoff and landing vehicles may be preferred to catapult launchers for shipborne RPV's. The use of air cushion takeoff and landing systems and of secondary aerodynamic lifting and arresting devices is under consideration. A.R.H.

N79-15952# Manufacture Belge de Lampes et de Materiel Electronique, Brussels (Belgium).
DESIGN AND OPERATION OF EPERVIER RECONNAISSANCE RPV
C. Derouck *In* Von Karman Inst. for Fluid Dyn. RPV's-Aerodyn. and Related Topics, Vol. 2 1977 19 p (For primary document see N79-15949 07-05)
Copyright. Avail: NTIS HC A12/MF A01

Requirements for a totally integrated RPV system for target acquisition and identification are discussed. The Epervier system which uses a compact delta wing aircraft is described. The system comprises (1) unmanned vehicles which can be equipped with different types of sensors for day and night missions; (2) highly mobile launchers with associated check-out equipment; (3) a mobile drone control center; (4) maintenance and check-out equipment; and (5) a mobile data processing laboratory. Operational experience demonstrates the main features of the system are low cost, high mobility, great accuracy, navigational flexibility, zone coverage capability, and outstanding mission reliability. A.R.H.

N79-15953# Army Missile Command, Redstone Arsenal, Ala.
FEASIBILITY STUDY OF MINI-RPV FOR ATTACK
R. B. Powell, D. W. Holder, and R. E. Dickson *In* Von Karman Inst. for Fluid Dyn. RPV's-Aerodyn. and Related Topics, Vol. 2 1977 79 p refs (For primary document see N79-15949 07-05)
Copyright. Avail: NTIS HC A12/MF A01

A computer simulation was conducted to determine the terminal trajectory and system effectiveness of a ground launched mini-RPV with a midcourse trajectory to target area. Human performance in controlling and attack RPV was also simulated. The weapon system is under consideration for providing surveillance and designation to assure survivability in hostile air defense environments, for over-the-hill surveillance, as an expendable jammer in electronic warfare, and as an attack RPV. Simulation validation and flight tests results are discussed. A.R.H.

N79-15954# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
ARTIFICIAL ICING TEST PHOBIC COATINGS ON UH-1H HELICOPTER ROTOR BLADES Final Report
John S. Tulloch, Raymond B. Smith, Frederick S. Doten, and John A. Bishop Jun. 1978 80 p refs
(AD-A059875; USAAEFA-77-30) Avail: NTIS HC A05/MF A01 CSCL 11/3

The United States Army Aviation Engineering Flight Activity conducted a limited evaluation of the General Electric G697 compound and the Dow Corning E2460-40-1 substance to determine if either was useful as an ice phobic coating on UH-1H helicopter rotor blades. Testing was conducted at Spokane, Washington, from 9 January through 8 February 1978. During the tests 23.2 flight hours were accumulated of which 6.5 hours were in the icing environment. Within the scope of this test both and G697 and the E2460-40-1 aided in shedding ice accreted on the main rotor blades. GRA

N79-15955# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
IMPEDANCE MEASUREMENTS ON A SPINNING MODEL HELICOPTER ROTOR
R. Cansdale and D. R. Gaukroger London Aeron. Res. Council 1978 48 p ref Supersedes RAE-TR-76086; ARC-37251
(ARC-CP-1389; BR63389; RAE-TR-76086; ARC-37251) Avail: NTIS HC A03/MF A01; HMSO £ 2.50; PHI

The technique for measuring rotor impedances at the shaft of a model rotor was further developed. Values of impedance are presented for a four-blade rotor of semi-rigid design operating at zero lift, zero advance ratio, and a range of rotational speeds. The problems of interpreting and applying rotor impedances are discussed. G.G.

N79-15956# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
THE DEVELOPMENT OF A PARAMETRIC METHOD OF MEASURING FIN FATIGUE LOADS BASED ON FLIGHT MEASUREMENTS ON A LIGHTNING Mk.T5
Anne Burns, J. P. Thompson, and E. W. Wells London Aeron. Res. Council 1978 58 p refs Supersedes RAE-TR-76161; ARC-37442
(ARC-R/M-3824; BR64876; RAE-TR-76161; ARC-37442) Avail: NTIS HC A04/MF A01; HMSO £ 6; PHI

Load measurement is discussed in which load is deduced from a statistical correlation with an appropriate combination of aircraft motion variables and control surface angles. A full-scale flight experiment on a Lightning Mk T5 is described aimed at developing a parametric method for the measurement of fin fatigue loads under operational conditions. An empirical relationship was established between the fin root bending moment, as determined from a multi-strain gauge installation, and a combination of parameters. The parameters from which the combination is selected include translational and rotational accelerations, rates of rotation, rudder angle and angle of sideslip. The study covers the measurement of fin loads under a wide range of loading conditions. G.G.

N79-16261# General Atomic Co., San Diego, Calif.
LARGE CLOSED-CYCLE GAS TURBINE PLANT
Colin F. McDonald *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbine, Vol. 1 1977 265 p refs (For primary document see N79-16260 07-37)
(Contract E(04-3)-167; Gen. Atomic Proj. 2095; Gen. Atomic Proj. 4351; Gen. Atomic Proj. 3227)
(GA-A-14311) Copyright. Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-15957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASURED AND PREDICTED NOISE OF THE AVCO-LYCOMING YF-102 TURBOFAN NOISE
Bruce J. Clark, Jack G. McArdle, and Leonard Homyak 1979 18 p refs Presented at 5th Aeroacoustics Conf., Seattle, 12-14 Mar. 1979; sponsored by AIAA
(NASA-TM-79069; E-9885; AIAA-Paper-79-0641) Avail: NTIS

HC A02/MF A01

Acoustic testing of the AVCO-Lycoming YF-102 turbofan engine was done on a static test stand in support of the quiet short-haul research aircraft acoustic design. Overall noise levels were dominated by the fan noise emanating from the exhaust duct, except at high power settings when combination tones were generated in the fan inlet. Component noise levels, calculated by noise prediction methods were in reasonable agreement with the measured results. Far-field microphones placed at ground level were found superior to those at engine centerline height, even at high frequencies. J.A.M.

N79-15958*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE GATE STUDIES: ASSESSING THE POTENTIAL OF FUTURE SMALL GENERAL AVIATION TURBINE ENGINES

William C. Strack 1979 24 p refs Presented at the Intern. Ann. Gas Turbine Conf., San Diego, Calif., 11-15 Mar. 1979; sponsored by Am. Soc. of Mechanical Engineers

(NASA-TM-79075; E-9892) Avail: NTIS HC A02/MF A01 CSCL 21E

Four studies were completed that explore the opportunities for future General Aviation turbine engines (GATE) in the 150-1000 SHP class. These studies forecasted the potential impact of advanced technology turbine engines in the post-1988 market, identified important aircraft and missions, desirable engine sizes, engine performance, and cost goals. Parametric evaluations of various engine cycles, configurations, design features, and advanced technology elements defined baseline conceptual engines for each of the important missions identified by the market analysis. Both fixed-wing and helicopter aircraft, and turboshaft, turboprop, and turbofan engines were considered. Sizable performance gains (e.g., 20% SFC decrease), and large engine cost reductions of sufficient magnitude to challenge the reciprocating engine in the 300-500 SHP class were predicted. J.A.M.

N79-15959*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPLICATIONS OF VELOCITY POTENTIAL FUNCTION TO ACOUSTIC DUCT PROPAGATION AND RADIATION FROM INLETS USING FINITE ELEMENT THEORY

K. J. Baumeister and R. K. Majjigi (GE Co., Cincinnati, Ohio) 1979 12 p refs Presented at the 5th Aeroacoustics Conf., Seattle, Wash., 12-14 Mar. 1979; sponsored by AIAA

(NASA-TM-79071; E-9888) Avail: NTIS HC A02/MF A01 CSCL 21E

A finite element velocity potential program was developed to study acoustic wave propagation in complex geometries. For irrotational flows, relatively low sound frequencies, and plane wave input, the finite element solutions showed significant effects of inlet curvature and flow gradients on the attenuation of a given acoustic liner in a realistic variable area turbofan inlet. The velocity potential approach can not be used to estimate the effects of rotational flow on acoustic propagation, since the potential acoustic disturbances propagate at the speed of the media in sheared flow. Approaches are discussed that are being considered for extending the finite element solution to include the far field, as well as the internal portion of the duct. A new matrix partitioning approach is presented that can be incorporated in previously developed programs to allow the finite element calculation to be marched into the far field. The partitioning approach provided a large reduction in computer storage and running times. J.A.M.

N79-15960*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ANALYSIS OF RADIATION PATTERNS OF INTERACTION TONES GENERATED BY INLET RODS IN THE JT15D ENGINE

M. F. Heidmann and A. V. Saule 1979 27 p refs Presented at the 5th Aeroacoustics Conf., Seattle, 12-14 Mar. 1978; sponsored by AIAA

(NASA-TM-79074; E-9891) Avail: NTIS HC A03/MF A01 CSCL 21E

Interaction tones were intentionally generated by circumferential arrays of equally spaced rods that protrude radially from the inlet wall near the face of the 28-blade fan. Arrays of 28 and 41 rods, selected to give specific far field radiation properties, were tested. The expected properties were readily apparent in the measured radiation patterns. A more detailed analysis of the test data showed both the precision and limitations of the applied acoustic theory. Rods protruding 23 percent of the radius predominantly generated only lowest radial order modes, as expected. Measured and predicted radiation patterns were generally in good agreement. The agreement, however, depended on a significant degree of implied refraction due to inlet velocity gradients. Refraction, if present, would impact static-flight noise comparisons. Author

N79-15961*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE ROTARY COMBUSTION ENGINE: A CANDIDATE FOR GENERAL AVIATION

1978 190 p refs Symp. held at Cleveland, Ohio, 28 Feb. 1978

(NASA-CP-2067; E-9800) Avail: NTIS HC A09/MF A01 CSCL 21A

The state of development of the rotary combustion engine is discussed. The nonturbine engine research programs for general aviation and future requirements for general aviation powerplants are emphasized. For individual titles, see N79-15962 through N79-15968.

N79-15962*# National Aeronautics and Space Administration, Washington, D. C.

OVERVIEW OF NASA GENERAL AVIATION PROGRAM

Roger L. Winblade *In* NASA. Lewis Res. Center The Rotary Combust. Engine 1978 p 1-11 (For primary document see N79-15961 07-07)

Avail: NTIS HC A09/MF A01 CSCL 21A

The NASA efforts devoted to new technology for general aviation are summarized. Areas covered include: (1) improved safety through improved crashworthy structural design, spin resistance, and improved operations around uncontrolled airports; (2) reduced environmental impact for both reciprocating and turbine engines; and (3) research for improvement in the performance of both aerodynamic and system components. J.M.S.

N79-15963*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

GENERAL AVIATION ENERGY-CONSERVATION RESEARCH PROGRAMS

Edward A. Willis *In its* The Rotary Combust. Engine 1978 p 13-35 refs (For primary document see N79-15961 07-07)

Avail: NTIS HC A09/MF A01 CSCL 21A

A review is presented of nonturbine general aviation engine programs underway at the NASA-Lewis Research Center. The program encompasses conventional, lightweight diesel, and rotary engines. Its three major thrusts are: (1) reduced SFC's; (2) improved fuels tolerance; and (3) reducing emissions. Current and planned future programs in such areas as lean operation, improved fuel management, advanced cooling techniques, and advanced engine concepts, are described. These are expected to lay the technology base, by the mid to latter 1980's, for engines whose total fuel costs are as much as 30% lower than today's conventional engines. J.M.S.

N79-15964*# Toyo Kogyo Co. Ltd., Hiroshima (Japan).

DEVELOPMENT STATUS OF ROTARY ENGINE AT TOYO KOGYO

Kenichi Yamamoto *In* NASA. Lewis Res. Center The Rotary Combust. Engine 1978 p 37-84 (For primary document see N79-15961 07-07)

Avail: NTIS HC A09/MF A01 CSCL 21A

Progress in the development of rotary engines which use a thermal reactor as the primary part of the exhaust emission control system is reviewed. Possibilities of further improvements in fuel economy of future rotary engines are indicated. J.M.S.

N79-15965*# Audi NSU Auto Union A.G., Neckarsulm (West Germany).

UPDATE OF DEVELOPMENT ON THE NEW AUDI NSU ROTARY ENGINE GENERATION

Richard vanBasshuysen *In* NASA. Lewis Res. Center The

Rotary Combust. Engine 1978 85-107 (For primary document see N79-15961 07-07)
Avail: NTIS HC A09/MF A01 CSCL 21A

Rotary engines with a chamber volume of 750 cc as a two rotor automotive powerplant, called KKM 871 are described. This engine is compared to a 3 liter or 183 cubic inch, six-cylinder reciprocating engine. Emphasis is placed on exhaust emission control and fuel economy. J.M.S.

N79-15966*# Audi NSU Auto Union A.G., Neckarsulm (West Germany).
REVIEW OF THE RHEIN-FLUGZEUGBAU WANKEL POWERED AIRCRAFT PROGRAM
Manfred Riethmueller *In* NASA. Lewis Res. Center The Rotary Combust. Engine 1978 p 109-122 (For primary document see N79-15961 07-07)
Avail: NTIS HC A09/MF A01 CSCL 21A

The development of light aircraft with special emphasis on modern propulsion systems and production is discussed in terms of the application of rotary engines to aircraft. Emphasis is placed on the integrated ducted-fan propulsion system using rotary engines. J.M.S.

N79-15967*# Curtiss-Wright Corp., Wood-Ridge, N.J.
ROTARY ENGINE DEVELOPMENTS AT CURTISS-WRIGHT OVER THE PAST 20 YEARS AND REVIEW OF GENERAL AVIATION ENGINE POTENTIAL
Charles Jones *In* NASA. Lewis Res. Center The Rotary Combust. Engine 1978 p 123-174 refs (For primary document see N79-15961 07-07)
Avail: NTIS HC A09/MF A01 CSCL 21A

The development of the rotary engine as a viable power plant capable of wide application is reviewed. Research results on the stratified charge engine with direct chamber injection are included. Emission control, reduced fuel consumption, and low noise level are among the factors discussed in terms of using the rotary engine in general aviation aircraft. J.M.S.

N79-15968*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENGINE REQUIREMENTS FOR FUTURE GENERAL AVIATION AIRCRAFT
Joseph W. Stickle *In* NASA. Lewis Res. Center The Rotary Combust. Engine 1978 p 175-186 (For primary document see N79-15961 07-07)
Avail: NTIS HC A09/MF A01 CSCL 21A

The market place is examined for general aviation aircraft into the 1980's. The visible constraints that engine manufacturers must face regardless of the type of cycle are indicated. J.M.S.

N79-15969*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF TWO INFLOW CONTROL DEVICES FOR FLIGHT SIMULATION OF FAN NOISE USING A JT15D ENGINE
W. L. Jones, J. G. McArdle, and L. Homyak 1979 17 p refs Presented at 5th Aeroacoustics Conf., Seattle, Washington, 12-14 Mar. 1978; sponsored by AIAA
(NASA-TM-79072; E-9889) Avail: NTIS HC A02/MF A01 CSCL 21E

The program was developed to accurately simulate flight fan noise on ground static test stands. The results generally indicated that both the induct and external ICD's were effective in reducing the inflow turbulence and the fan blade passing frequency tone generated by the turbulence. The external ICD was essentially transparent to the propagating fan tone but the induct ICD caused attenuation under most conditions. Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-15970# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND ANALYSIS OF AN ACTIVE JET CONTROL SYSTEM FOR HELICOPTER SLING LOADS M.S. Thesis - Old Dominion Univ.
Mark D. Pardue and J. D. Shaughnessy Jan. 1979 35 p refs (NASA-TP-1397; L-11836) Avail: NTIS HC A03/MF A01 CSCL 01C

An active jet control system for stabilizing the swinging motion of helicopter external sling loads in hover (and forward flight) is described. A velocity feedback control law is obtained by using classical control theory. A nondimensional analysis is performed to give a simple chart for determining the appropriate value of feedback gain as a function of cable length, sling length, and load parameters to provide theoretical damping ratios of 0.7. The sensitivity to parameter changes was studied, and + or - a 10 percent change in parameters was found to affect system performance only slightly. Implementation of the control scheme in a nonlinear simulation produced damping ratios equal to or greater than those calculated. A limited number of piloted flights in a visual simulator indicated a significant reduction in load swinging in the transition to hover, and thus the pilot was able to concentrate on load altitude and position control. Author

N79-15971# Royal Aircraft Establishment, Farnborough (England).
THE RESPONSE OF AIRCRAFT TO DISCRETE RAMP GUSTS
A. G. Purcell Nov. 1977 31 p refs
(RAE-TR-77165; BR61322) Avail: NTIS HC A03/MF A01

An aircraft response as a function of time on encountering an isolated ramp gust was derived from its response to a unit step gust. Two FORTRAN programs are described which treat separately straight ramp and smooth ramp (one-minus-cosine) gust profiles. The (critical) gust length causing maximum dynamic response was determined, and responses to simple gust patterns (pairs) were investigated. J.A.M.

N79-15972# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
WEIGHT OPTIMISATION WITH FLUTTER CONSTRAINTS
L. T. Niblett London Aeron. Res. Council 1978 29 p refs Supersedes RAE-TR-77130; ARC-37537
(ARC-R/M-3823; BR64875; RAE-TR-77130; ARC-37537) Avail: NTIS HC A03/MF A01; HMSO £ 3.50; PHI

It was argued that the method of applying a flutter constraint in weight optimization was so complicated that it was best to apply it only if the structure obtained from optimization with the other constraints alone was flutter-prone. In this way, much unnecessary and possibly inappropriate calculation could be avoided. A method of weight optimization with only flutter constraints, based on inverse iteration, which can be used in conjunction with any suitable optimization procedure was suggested. Its use in association with more than one procedure is described as is the optimization of a wing of fairly-high aspect ratio. J.A.M.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N79-15973# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PILOTED AIRCRAFT ENVIRONMENT SIMULATION TECHNIQUES
Oct. 1978 306 p refs In ENGLISH and FRENCH Presented at the Flight Mech. Specialists' Meeting, Brussels, 24-27 Apr. 1978
(AGARD-CP-249; ISBN-92-835-0222-1) Avail: NTIS

HC A14/MF A01

Papers presented at the Flight Mechanics Panel Specialists' Meeting on Piloted Aircraft Environment Simulation Techniques held in Brussels, Belgium, 24-27 April 1978 are reported. The conference was divided into the following sessions: (1) requirements on simulation of the environment; (2) simulation of the atmospheric environment; (3) atmospheric models for simulation; (4) out of the cockpit visual scenes; (5) visual versus nonvisual motion cues; (6) motion simulation; and (7) up and away mission phases. For individual titles, see N79-15974 through N79-15999.

N79-15974# Tactical Air Warfare Center, Eglin AFB, Fla.
CURRENT DEFICIENCIES IN SIMULATION FOR TRAINING
Charles D. Brown *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 7 p (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

A representative of the Tactical Air Warfare Center (USAFTAWC) is given the opportunity to air some of his views on the subject of aircrew training devices and their utilization. Some of the major simulator modifications of some combat aircraft are discussed. G.Y.

N79-15975# British Aerospace Aircraft Group, Warton (England).
SIMULATING THE VISUAL APPROACH AND LANDING
A. G. Barnes *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 13 p refs (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

A general view is taken of the standards of simulation which are currently achieved in training and research simulators. The approach and landing is subdivided into separate phases; straight-in approach, curved approach, flare and ground roll. The piloting task is critically examined in each case with particular reference to the use of outside world visual cues. The merits and deficiences of existing simulators, as a means of providing the equivalent information, are then discussed. Improvements to the overall simulation of the landing approach are more likely to emerge if a better understanding of the information which the pilot uses in each phase is available. This paper is an attempt to assemble some of the information pieces, and to relate them to the technology of simulation. G.Y.

N79-15976# Boeing Aerospace Co., Seattle, Wash. Crew Systems.
VISUAL CRITERIA FOR OUT OF THE COCKPIT VISUAL SCENES
Conrad L. Kraft and Larry W. Shaffer *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 18 p refs Prepared in cooperation with Gen. Elec. Co., Daytona Beach, Fla. (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

In 1973 a small committee of four men, representative of the disciplines of electronics, flight and vision, were asked to develop the criteria for a visual system for flight crew training in air transportation. This is a review of the visual system criteria developed for this out of the cockpit visual scene generation. The available classes of visual systems in 1973 were three: film and anamorphic projection, closed circuit television and fixed terrain model, and computer generated image system. The last had the highest risk, but promised much greater flexibility, higher quality images and a day/night scene. G.Y.

N79-15977*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MISSION ENVIRONMENT SIMULATION FOR ARMY ROTORCRAFT DEVELOPMENT: REQUIREMENTS AND CAPABILITIES
David L. Key, Billy L. Odneal, and John B. Sinacori *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 17 p refs Prepared in cooperation with Army Aviation Res. and Develop. Command, Moffett Field, Calif. (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01 CSCL 01E

The rich and varied detail visible in terrain flight must be presented by a wide field-of-view system with much detail and high resolution. The rotary-wing R&D simulator must have great versatility for easy change of cab configurations and the capability to accommodate a two or three man crew. Basic specifications for an adequate visual display were developed and are compared with current and forecasted techniques for image generation and presentation. Results of a study performed to determine the feasibility of meeting these requirements using the current technology of TV camera-model image generation and projected display are discussed and an assessment of the possibility that computer generated imagery can achieve the desired level of detail is presented. G.Y.

N79-15978# Naval Air Test Center, Patuxent River, Md. Rotary Wing Aircraft Test Directorate.
ENVIRONMENTAL REQUIREMENTS FOR SIMULATED HELICOPTER/VTOL OPERATIONS FROM SMALL SHIPS AND CARRIERS
C. W. Woomer and R. L. Williams *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 13 p refs Prepared in cooperation with McDonnell-Douglas Electron. Co., St. Charles, Mo. (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

The specific requirements for the simulated environment to satisfactorily provide training for shipboard takeoff and landing are discussed. Test techniques to validate trainer fidelity in flying qualities, performance, and environmental simulation are discussed. The specific subject of calligraphic visual systems is extensively covered, including a report on the current state-of-the-art as related to the at-sea environment. The utilization of a high-fidelity trainer is explored for research as well as for expanded fleet training. G.Y.

N79-15979# Boeing Co., Seattle, Wash.
PROPOSED ADVANCEMENTS IN SIMULATION OF ATMOSPHERIC PHENOMENA FOR IMPROVED TRAINING
William J. Allsopp *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 11 p refs (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

Obviously, flight simulators are a major training vehicle and the desire to reduce in-airplane training is the driving force to obtain better flight simulator visual systems. As the result of both commercial and military applications, major advancements were made in simulator visual systems, resulting in commercial use of the various electronically generated visual systems. Improvements appear to be required in many areas, such as field of view, resolution, brightness, scene content, lights, visual/motion integration, simulated airplane short-period response, and atmospheric environment. The latter is the subject of this paper. G.Y.

N79-15980# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
NON-GAUSSIAN STRUCTURE OF THE SIMULATED TURBULENT ENVIRONMENT IN PILOTED FLIGHT SIMULATION
G. A. J. vandeMoesdijk *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 27 p refs (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

A description of the general nongaussian characteristics of actual atmospheric turbulence as observed in the atmosphere is presented. A nongaussian turbulence simulation model is described. The nongaussian characteristics are classified as patchiness and intermittency, both dependent on higher order statistics. These nongaussian characteristics are mathematically elaborated and described. The effects of patchiness on pilot's behavior, using physiological parameters are evaluated in a small simulator experiment. G.Y.

N79-15981# Federal Aviation Administration, Washington, D. C. Systems Research and Development Service.
HANDLING QUALITIES OF A SIMULATED STOL AIRCRAFT IN NATURAL AND COMPUTER-GENERATED TURBULENCE AND SHEAR
S. R. M. Sinclair and T. C. West *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 16 p refs Prepared in cooperation with Natl. Aeron. Estab., Ottawa (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

A program was undertaken to measure naturally-occurring wind shear and turbulence along the approach to an urban STOL-port and to investigate the effects of these atmospheric disturbances on the flying qualities of a powered-lift STOL aircraft. The experiment entailed both an in-flight phase using the NAE (National Aeronautical Establishment of Canada) Airborne V/STOL Simulator and a ground-based simulation phase. G.Y.

N79-15982# Royal Aircraft Establishment, Farnborough (England).

VISIBILITY MODELLING FOR A LANDING SIMULATOR WITH SPECIAL REFERENCE TO LOW VISIBILITY

D. Johnson *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 10 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

When a simulator is used to demonstrate or investigate the effects of restricted visibility on a pilot's ability to land an aircraft it is important that the visual sequence displayed is as realistic as possible. The characteristics of the visual world by day and by night are described. In particular the topics of contrast, the apparent horizon and the perception of the lights are considered. A brief account is also given of the characteristics of some of the more commonly encountered fogs whose effects could usefully be represented in simulating low visibility conditions. These include shallow fogs and those with marked vertical density gradients. Various ways of simulating the outside world in general are briefly described and discussed in relation to fog and vision. G.Y.

N79-15983*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VISUAL SIMULATION REQUIREMENTS AND HARDWARE

John C. Dusterberry *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 7 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01 CSCL 01E

Requirements for any out-of-the-cockpit visual simulation system can easily lead to a set of system specifications which are clearly beyond the visual scene that can be produced by current technology. Therefore, the requirements of any proposed system must be assessed in light of the expected simulated aircraft and missions, experiments on pilot response, and available image generation and display hardware. A review is made of some of the recent experiments, and the results are related to aircraft and missions with particular emphasis on research and development simulators. Recent visual simulation hardware is considered in light of extending the range of applications of piloted aircraft simulators, and a method of design approach is proposed. G.Y.

N79-15984# Royal Aircraft Establishment, Farnborough (England).

LOW BUDGET SIMULATION IN WEAPON AIMING

P. Manville and E. D. Whybray *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 8 p (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

The Flight Systems Department at RAE (Royal Aircraft Establishment) has developed and operated a low budget research simulator, designed to explore aiming sequences, accuracies and real time usage in air-to-ground weapon delivery from low altitude. The simulator was expanded to permit the aiming sequences of air-to-air combat and air-to-ground designators to be evaluated. This paper describes a special purpose research simulator that was developed to study the close interaction of the crew and system during the vital moments prior to weapon delivery. The description of the techniques and equipment employed illustrates how accuracy and fidelity can be achieved within modest resources. G.Y.

N79-15985# Deutsche Lufthansa Aktiengesellschaft, Frankfurt am Main (West Germany).

THE LUFTHANSA DAY/NIGHT COMPUTER GENERATED VISUAL SYSTEM

M. Wekwerth *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 6 p (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

After defining some Computer Generated Image Visual System (CGI) terminology, the paper outlines the functioning of the system in a block diagram manner. The capabilities of the system with respect to display and computational capacity are discussed. The layout of the computer landscape model, the training aspects that influence the positioning of objects, the coloring and the color saturation are covered. A comparison between a conventional rigid model closed circuit television system and the CGI reveals the high flexibility of the CGI and its adaptability to varying training concepts. The shortcomings of CGI with respect to realism and picture detail are also shown. Remarks on future system requirements and improvements with respect to higher content (texture) and larger fields of view are presented. G.Y.

N79-15986# CAE Electronics Ltd., Montreal (Quebec).

RECENT ADVANCES IN TELEVISION VISUAL SYSTEMS

Brian L. Welch *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 12 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

A closed circuit television model board visual system, which was designed for a CH-47 helicopter, is described. The attributes and deficiencies of the system are discussed in an attempt to show how a model board based visual system suitable for full mission simulation in Nap of the earth environments could be designed. A new computer generated image visual system which makes extensive use of texture is presented as an alternative to the model board approach. The importance of realism in full mission simulators as distinct from flight and weapons trainers is also discussed. G.Y.

N79-15987# Redifon Simulation Ltd., Crawley (England).

A HIGH RESOLUTION VISUAL SYSTEM FOR THE SIMULATION OF IN-FLIGHT REFUELLING

Martin J. P. Bolton *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 14 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

A unique visual system, developed for the simulation of the in-flight refuelling task is described. It incorporates both wide bandwidth and computer generated image (CGI) techniques. The in-flight refuelling task and the simulation requirements are reviewed. Redifon's previous experience in this field is outlined and the overall design of the latest visual system is described. The problem of providing the essential visual information within the constraints of cost and available technology is presented. The special effects unit, which provides all video processing and image generation functions under the control of an autonomous computer, is examined. S.E.S.

N79-15988# Naval Training Equipment Center, Orlando, Fla. Army Office of Project Manager for Training Devices.

WIDE ANGLE VISUAL SYSTEM DEVELOPMENTS

Carl R. Driskell *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 12 p (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

Two alternative approaches to a high resolution, wide angle visual system for military flight simulation were described. The basic feasibility of each system was established through studies and subsystem demonstrations but the practical realization of each total system design remains to be proven. Breadboard models of each visual system are developed. S.E.S.

N79-15989*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

VISUALLY INDUCED MOTION IN FLIGHT SIMULATION

Lawrence R. Young *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 8 p refs (For primary document see N79-15973 07-09)

(Grant NsG-2236; Contract F33615-76-C-0039)

Avail: NTIS HC A14/MF A01 CSCL 01E

Visually induced yaw (circularvection) resulting from a moving wide field presentation, and its interaction with vestibular yaw cues generated by base motion is discussed. A model is presented for the interaction between visual and motion cues in yaw which rationalizes the high frequency utilization of vestibular cues and

the low frequency use of visual cues to support sustained angular velocity. The implications for fixed and moving base flight simulator design are discussed. Similar considerations apply to visually induced linear velocity (linearvection) and interesting asymmetries in the fore-aft direction are noted. Visually induced pitch and roll are discussed and modelled in terms of conflict between the visually induced motion and the information regarding attitude based upon graviceptor signals. S.E.S.

N79-15990# Royal Aircraft Establishment, Bedford (England). Flight Systems Dept.

MOTION VERSUS VISUAL CUES IN PILOTED FLIGHT SIMULATION

J. R. Hall *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 13 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

In the ground based simulation of piloted flight the provision of adequate cues to the pilot is essential for both training and the successful evaluation of handling and ride qualities. Two examples are presented to show that motion cues can be vital even when adequate alternative visual cues are available. The first shows that practical, low gain, roll motion cues are better than nominally perfect peripheral vision cues for controlling a vehicle with an unstable dutch roll mode and the second that motion can be vital even for developing items such as head-up displays for which it might not at first sight seem necessary. Results indicate that for the prediction and evaluation of handling qualities using a piloted flight simulator it is not always sufficient for the pilot to achieve a similar performance in the simulator as in flight: it is also necessary that he should adopt the same control strategy. To achieve this it is often essential to provide the pilot with motion cues as no substitute in these circumstances has yet been found. S.E.S.

N79-15991# Air Force Human Resources Lab., Wright-Patterson AFB, Ohio. Advanced Systems Div.

MOTION AND FORCE CUING REQUIREMENTS AND TECHNIQUES FOR ADVANCED TACTICAL AIRCRAFT SIMULATION

William B. Albery, Don R. Gum, and Gerald J. Kron (Singer Co., Binghamton, N. Y.) *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 10 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

Data base development efforts which are in process have provided a better understanding of the type of motion and force cuing required for U.S. Air Force tactical aircraft simulators and the type of devices necessary to effectively and efficiently provide this cuing. An advanced g-cuing system was developed which provides both rapid onset and sustained cuing. It is capable of stimulating the important tactile and pressure, as well as nonvestibular proprioceptive, human sensory modalities throughout the frequency spectrum and for the duration of motion and force cuing presented during most tactical flight maneuvers. High-g augmentation devices are investigated and designed which should efficiently provide some of the additional cuing present during extremely high-g flight environments. S.E.S.

N79-15992# National Aerospace Lab., Amsterdam (Netherlands).

INFLUENCE OF MOTION WASH-OUT FILTERS ON PILOT TRACKING PERFORMANCE

M. F. C. vanGool *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 5 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

The NLR moving base flight simulator was investigated to establish the influence of the simulator motion wash-out filters in the pitch and roll axis on the performance of four pilots when stabilizing an aircraft disturbed by turbulence in either of these axes. For this compensatory tracking task, pilot describing functions, remnant spectra and other performance measures were determined. The results lead to the conclusion that, for the task under consideration, no significant differences can be observed when the break frequency of the (linear second-order) wash-out filter is varied from 0.1 rad/sec to 0.5 rad/sec. Then performance in either condition is considerably better when compared to fixed-base results. This is also reflected in the pilot comments and effort ratings, stating that the task is easier with motion. S.E.S.

N79-15993# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

DYNAMIC CHARACTERISTICS OF FLIGHT SIMULATOR MOTION SYSTEMS

Paul T. Kemmerling, Jr. *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 20 p refs (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

Recognition is made of the complete lack of substantive data on the quality of motion produced by multiple degree of freedom aircraft simulator motion systems, and efforts made to produce this data are discussed. Working Group #07 of the Flight Mechanics Panel of AGARD was given the charter to identify and define the pertinent physical characteristics of flight simulator motion systems, establish procedures for their measurement and prepare a report on their findings. The seven main characteristics identified by the Group are outlined, and efforts by several of the members to apply the characteristic techniques in laboratory measurements are discussed. Acknowledgement is made of the difficulties in establishing universally workable definitions and techniques for cataloguing motion characteristics, and alternatives are suggested. The conclusion is reached that a taxonomy of motion characteristics is a valuable asset in determining the optional use of currently available motion systems. Author

N79-15994# Cranfield Inst. of Technology Bedfordshire (England).

THE DEVELOPMENT AND EVALUATION OF A g SEAT FOR A HIGH PERFORMANCE MILITARY AIRCRAFT TRAINING SIMULATOR

N. O. Matthews and C. A. Martin *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 8 p (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

The original type of seat and attempts to improve its performance, leading to the design of a completely new concept in simulator g seats are tested. Philosophy behind the changes in design are considered and the implementation of these in terms of hardware are described. The proto-type model of the new seat were tested in conjunction with a 3 axis motion system of improved performance characteristics at Cranfield Institute of Technology, and the results of evaluations by a number of service test pilots and pilots are described. S.E.S.

N79-15995# Le Materiel Telephonique, Trappes (France). Div. Simulateurs et Systemes Electroniques.

SIX DEGREES OF FREEDOM LARGE MOTION SYSTEM FOR FLIGHT SIMULATORS

Michel Baret *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 8 p (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

The long-stroke, hollow-rod jack with hydrostatic bearings of the six degrees of freedom, large motion system is described. Techniques are provided that improve and reduce the level of unwanted accelerations normally generated by motion systems, while offering new possibilities in the study of control laws. S.E.S.

N79-15996# Centre d'Electronique de l'Armement, Bruz (France). Dept. Evaluation de Systeme et Simulation.

SIMULATION OF AERIAL COMBAT AT CELAR [SIMULATION DE COMBAT AERIEN DU CELAR]

Y. Hignard *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 6 p In FRENCH (For primary document see N79-15973 07-09)

Avail: NTIS HC A14/MF A01

A simulator developed for the French Air Force in 1971 facilitates technical and tactical research associated with the use of missiles in near aerial combat. The simulator comprises a number of originally designed components and was built at moderate cost. Modifications for improving the pilot environment include conforming the cabin to the Mirage FI, miniaturizing the horizon lantern, and introducing zoom optics in the device for

target projection. The new installation is expected to be operational at the end of 1978. Trans. by A.R.H.

N79-15997# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
DIFFERENCES BETWEEN SIMULATION AND REAL WORLD AT THE IABG AIR TO AIR COMBAT SIMULATOR WITH A WIDE ANGLE VISUAL SYSTEM
E. Vogl *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 11 p refs (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

The experiences of IABG with its Dual Flight Simulator (DFS) for air-to-air combat are presented. First of all IABG has discovered that air-to-air combat simulation without a motion system is no problem to the pilots. During the verification phase it was found that the results of simulations at DFS were very good. All simulator effects in respect to human factors were researched. Results indicated that these effects are unimportant to air-to-air combat simulators. S.E.S.

N79-15998# McDonnell Aircraft Co., St. Louis, Mo. Flight Simulation Dept.
MANNED AIR COMBAT SIMULATION: A TOOL FOR DESIGN DEVELOPMENT AND EVALUATION FOR MODERN FIGHTER WEAPON SYSTEMS AND TRAINING OF AIR-CREWS
R. H. Mathews *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 6 p (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01

Manned air combat simulation has matured into a major element in modern fighter aircraft design and development. The simulation fidelity now available allows meaningful training to be accomplished such that the U.S. Government is now procuring an Air Combat Maneuvering Simulator (ACMS) for fighter tactics training. The contributions of manned air combat simulation to the F-15 fighter weapon systems from design concept through successful introduction to squadron service are presented. Specific examples are given of airframe, avionics, and integrated systems simulation support in the design and development process. Flight and simulation results in several test programs including air combat maneuvering are compared. The Air Combat Maneuvering Simulator provided to the U.S. Navy for air combat training is described. S.E.S.

N79-15999*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
USE OF PILOTED SIMULATION FOR STUDIES OF FIGHTER DEPARTURE/SPIN SUSCEPTIBILITY
William P. Gilbert and Luat T. Nguyen *In* AGARD Piloted Aircraft Environ. Simulation Tech. Oct. 1978 13 p refs (For primary document see N79-15973 07-09)
Avail: NTIS HC A14/MF A01 CSCL 01E

The NASA-Langley Research Center has incorporated into its stall/spin research program on military airplanes the use of piloted, fixed-base simulation to complement the existing matrix of unique research testing techniques. The piloted simulations of fighter stall/departure flight dynamics are conducted on the Langley Differential Maneuvering Simulator (DMS). The objectives of the simulation research are reviewed. The rationale underlying the simulation methods and procedures used in the evaluation of airplane characteristics is presented. The evaluation steps used to assess fighter stall/departure characteristics are discussed. Simulation results are presented to illustrate the flight dynamics phenomena dealt with. The considerable experience accumulated in the conduct of piloted stall/departure simulation indicates that simulation provides a realistic evaluation of an airplane's maneuverability at high angles of attack and an assessment of the departure and spin susceptibility of the airplane. This realism is obtained by providing the pilot a complete simulation of the airplane and control system which can be flown using a realistic cockpit and visual display in simulations of demanding air combat maneuvering tasks. The use of the piloted simulation methods and procedures described were found very effective in identifying stability and control problem areas and in developing automatic control concepts to alleviate many of these problems. A good level of correlation between simulated flight dynamics and flight test results were obtained over the many fighter configurations studied in the simulator. S.E.S.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-16000*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Sep. - Oct. 1978
15 Dec. 1978 141 p refs
(Contract NAS7-100)
(NASA-CR-157647; JPL-PR-42-48) Avail: NTIS HC A07/MF A01 CSCL 22D

Progress in flight support, tracking and data acquisition research and technology, network engineering, hardware and software implementation, and operations at the Deep Space Network is reported. For individual titles, see N79-16001 through N79-16020.

N79-16001*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES **c14**
N. A. Renzetti *In its* The Deep Space Network 15 Dec. 1978 p 1-3 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

The objectives, functions, and organization of the Deep Space Network are summarized; deep space station, ground communication, and network operations control capabilities are described. J.M.S.

N79-16002*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN MONITOR AND CONTROL SYSTEM, MARK 3-78 **c14**
W. G. Stinnett *In its* The Deep Space Network 15 Dec. 1978 p 4-6 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

A description of the DSN Monitor and Control System, Mark 3-78, is discussed. The major implementation required to evolve from the Mark 3-75 to the Mark 3-78 configuration is also discussed. J.M.S.

N79-16003*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VIKING CONTINUATION MISSION SUPPORT **c15**
R. L. Gillette *In its* The Deep Space Network 15 Dec. 1978 p 7-11 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

The DSN support of Viking spacecraft activities from 1 July through 31 August 1978 is reported. The DSN Viking Command and Tracking support is included. J.M.S.

N79-16004*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PIONEER VENUS MISSION SUPPORT **c14**
A. C. Bouck *In its* The Deep Space Network 15 Dec. 1978 p 12-14 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

Activities within the Deep Space Network (DSN) to prepare for the Pioneer Venus Multiprobe Venusian Encounter are reported. J.M.S.

N79-16005*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HELIOS MISSION SUPPORT **c14**
P. S. Goodwin, W. N. Jensen, and G. M. Rockwell *In its* The Deep Space Network 15 Dec. 1978 p 15-17 ref (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

Activities of the DSN Network Operations Organization in support of the Helios Project from 15 August 1978 through 15 October 1978 are reported. J.M.S.

N79-16006*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CONVOLUTIONAL CODING RESULTS FOR THE MVM '73 X-BAND TELEMETRY EXPERIMENT **c17**
J. W. Layland *In its* The Deep Space Network 15 Dec. 1978 p 18-21 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 17B

Results of simulation of several short-constraint-length convolutional codes using a noisy symbol stream obtained via the turnaround ranging channels of the MVM'73 spacecraft are presented. First operational use of this coding technique is on the Voyager mission. The relative performance of these codes in this environment is as previously predicted from computer-based simulations. J.M.S.

N79-16007*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROWAVE RADIOMETER MEASUREMENT OF WATER VAPOR PATH DELAY: DATA REDUCTION TECHNIQUES **c46**
E. S. Claflin, S. C. Wu, and G. M. Resch *In its* The Deep Space Network 15 Dec. 1978 p 22-30 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 04A

Data reduction techniques are developed to compensate for water vapor path delay, a limiting error source in geodetic measurements made with very long baseline interferometry and in radio ranging to spacecraft. It is shown that water vapor path delay is proportional to a linear combination of saturation-corrected sky brightness temperatures, measured on and off the water vapor line. The effects of emission from liquid water droplets in clouds as well as most of the oxygen emission are removed by the off-line channel. Sky brightness temperatures are saturation-corrected or 'linearized' using estimates of effective sky temperatures made from surface temperature. Tipping curves are used to remove instrumental error. Coefficients are found by two methods: from a regression analysis of measured brightness temperatures versus radiosonde measured delay, and from a regression analysis of theoretical brightness temperatures versus radiosonde measured delay. In each case the coefficients are adjusted for differing climatic conditions by measurements of surface temperature, pressure, and relative humidity. Regression solutions are constrained to remove liquid water contributions and to give the correct slope for radiometer versus radiosonde path delay. J.M.S.

N79-16008*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LOW-NOISE RECEIVERS: S-BAND PARAMETRIC UP CONVERTER DEVELOPMENT **c32**
S. Petty, D. Neff, and D. Norris *In its* The Deep Space Network 15 Dec. 1978 p 31-47 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 17B

The combination of a cryogenically-cooled parametric upconverter and a higher frequency maser post amplifier was proposed as a method of achieving maser-like receiver noise temperatures over much larger instantaneous bandwidths and tuning ranges than are presently obtainable with masers in the range of 1 to 18 GHz. An experimental 2.0- to 2.5-GHz parametric upconverter/maser system was developed to explore these possibilities. Initial tests of this system resulted in an effective input noise temperature of 3.1 K at 2295 MHz and 3.2 K at 2388 MHz. The parametric upconverter logged over 1500 hours at 4.5 K and underwent 5 thermal cycles (300 K to 4.5 K to 300 K) without degradation. J.M.S.

N79-16009*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SIMULTANEOUS DUAL-FREQUENCY, ROUND-TRIP CALIBRATION OF DOPPLER DATA WITH APPLICATION TO RADIO SCIENCE EXPERIMENTS **c32**
A. L. Berman *In its* The Deep Space Network 15 Dec. 1978 p 49-54 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 17B

Simultaneous dual-frequency, round-trip calibration of Doppler data is discussed in light of unequal spacecraft turnaround ratios at S- and X-band. The impact of unequal turnaround ratios on calibration accuracies in the specific cases of the Gravitational Wave Detection Experiment and the Solar Gravitational Quadrupole Moment Experiment is considered. J.M.S.

N79-16010*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SOLAR WIND TURBULENCE EVENT DURING THE VOYAGER 1978 SOLAR CONJUNCTION PROFILED VIA NEW DSN RADIO SCIENCE **c92**
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1978 p 55-58 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 03B

A radio science data capability within the DSN Tracking System is described. This capability consists of routine provision of phase fluctuation data concurrently computed over several different time scales. This capability was used to observe phase fluctuation spectral characteristics during a rapid increase in solar wind turbulence that occurred during a July 23, 1978 track of the Voyager 1 spacecraft by Deep Space Station 11. It is suggested that the capability will prove useful in studies of variations of solar wind phase fluctuation spectral characteristics with, for instance, parameters such as the solar cycle and radial distance. J.M.S.

N79-16011*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIAL AND SOLAR CYCLE VARIATIONS IN THE SOLAR WIND PHASE FLUCTUATION SPECTRAL INDEX AS DETERMINED FROM VOYAGER 1978 SOLAR CONJUNCTION DATA **c92**
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1978 p 59-65 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 03B

Columnar spectral index information that has been extracted from a sizable volume of Voyager 1978 solar conjunction Doppler phase fluctuation data is presented. The Voyager 1978 results, when compared to similar information derived from the 1976 Helios and Viking Solar Conjunctions, lead to the following inferences: (1) there has been a significant change in the spectral index from 1976 to 1978; (2) there is continuing evidence that favors a slight (positive) correlation between the spectral index and the solar cycle; and (3) there is little or no evidence in support of a radial variation of the spectral index. J.M.S.

N79-16012*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SIMPLIFIED ALGORITHM FOR CORRECTING BOTH ERRORS AND ERASURES OF R-S CODES **c61**
I. S. Reed (Southern California Univ.) and T. K. Truong *In its* The Deep Space Network 15 Dec. 1978 p 66-71 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

Using the finite field transform and continued fractions, a simplified algorithm for decoding Reed-Solomon (R-S) codes is developed to correct erasures caused by other codes as well as errors over the finite field GF (q(m), where q is a prime and m is an integer. Such an R-S decoder can be faster and simpler than a decoder that uses more conventional methods. J.M.S.

N79-16013*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EVALUATION OF THE DSN SOFTWARE METHODOLOGY **c61**
A. Irvine and M. McKenzie *In its* The Deep Space Network 15 Dec. 1978 p 72-81 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

The effects of the DSN software methodology, as implemented under the DSN Programming System, on the DSN Mark 3 Data Subsystems Implementation Project (MDS) are described. The software methodology is found to provide a markedly increased visibility to management, and to produce software of greater reliability at a small decrease in implementation cost. It is also projected that additional savings will result during the maintenance phase. Documentation support is identified as an area that is receiving further attention. J.M.S.

N79-16014*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MBASIC BATCH PROCESSOR ARCHITECTURAL OVERVIEW **c60**
S. M. Reynolds *In its* The Deep Space Network 15 Dec. 1978 p 82-86 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

The MBASIC (TM) batch processor, a language translator designed to operate in the MBASIC (TM) environment is described. Features include: (1) a CONVERT TO BATCH command, usable from the ready mode; and (2) translation of the users program in stages through several levels of intermediate language and optimization. The processor is to be designed and implemented in both machine-independent and machine-dependent sections.

The architecture is planned so that optimization processes are transparent to the rest of the system and need not be included in the first design implementation cycle. J.M.S.

N79-16015*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
GCF HSD ERROR CONTROL c61
C. K. Hung *In its* The Deep Space Network 15 Dec. 1978 p 87-93 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

A selective repeat automatic repeat request (ARQ) system was implemented under software control in the Ground Communications Facility error detection and correction (EDC) assembly at JPL and the comm monitor and formatter (CMF) assembly at the DSSs. The CMF and EDC significantly improved real time data quality and significantly reduced the post-pass time required for replay of blocks originally received in error. Since the remote mission operation centers (RMOCs) do not provide compatible error correction equipment, error correction will not be used on the RMOC-JPL high speed data (HSD) circuits. The real time error correction capability will correct error burst or outage of two loop-times or less for each DSS-JPL HSD circuit. J.M.S.

N79-16016*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRACKING ERROR OF 100-m ANTENNA DUE TO WIND GUST c32
M. Massoudi *In its* The Deep Space Network 15 Dec. 1978 p 94-101 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

A procedure is shown to derive root-mean-square tracking error for an antenna system in response to wind gust loading. Example calculations are illustrated for the design of a proposed 100 m antenna. The effect of wind gust correlation is also considered. J.M.S.

N79-16017*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
S-BAND MASER PHASE DELAY STABILITY TESTS c36
J. M. Urech, F. Alcazar, J. Galvez, A. Rius, and C. A. Greenhall *In its* The Deep Space Network 15 Dec. 1978 p 102-117 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 20E

The results of the S-band traveling wave maser phase delay stability measurements performed at DSS 62 are presented. These tests were required for the Pioneer-Venus wind experiment. J.M.S.

N79-16018*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PRELIMINARY MODEL FOR HIGH-POWER-WAVEGUIDE ARCING AND ARC PROTECTION c33
H. C. Yen *In its* The Deep Space Network 15 Dec. 1978 p 118-125 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

The arc protection subsystems that are implemented in the DSN high power transmitters are discussed. The status of present knowledge about waveguide arcs is reviewed in terms of a simple engineering model. A fairly general arc detection scheme is also discussed. Areas where further studies are needed are pointed out along with proposed approaches to the solutions of these problems. J.M.S.

N79-16019*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NEW X-BAND MICROWAVE EQUIPMENT AT THE DSN 64-METER STATIONS c32
R. Hartop *In its* The Deep Space Network 15 Dec. 1978 p 126-128 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

The performance and capabilities of the DSN 64 m antennas at X-band are considered including extensive modifications to the XRO cone assemblies. The changes include a feed assembly with a dual hybrid mode horn and orthogonal mode junction, dual traveling wave masers, and receiver mode selector. J.M.S.

N79-16020*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN WATER VAPOR RADIOMETER DEVELOPMENT: RECENT WORK, 1978 c35
P. D. Batelaan and S. D. Slobin *In its* The Deep Space Network 15 Dec. 1978 p 129-135 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 14B

A water vapor radiometer(WVR) was developed that measures the atmospheric noise temperature at two different frequencies near 22 GHz. These noise temperature are used in empirical-theoretical equations that yield tropospheric range delay, in centimeters, through the atmosphere along the beam of the WVR. This range correction is then applied, as needed, to measurements concerning spacecraft range and to VLBI baseline determinations. The WVR design and calibration techniques are discussed. J.M.S.

N79-16021*# Communications Research Labs., Santa Ana, Calif.
GEOS-2 REFRACTION PROGRAM SUMMARY DOCUMENT Final Report
A. J. Mallinckrodt 28 Apr. 1977 168 p refs
(Contract NAS5-20766)
(NASA-CR-156791; CRL-628-1) Avail: NTIS HC A08/MF A01 CSCL 22B

Data from an extensive array of collocated instrumentation at the Wallops Island test facility were intercompared in order to (1) determine the practical achievable accuracy limitations of various tropospheric and ionospheric correction techniques; (2) examine the theoretical bases and derivation of improved refraction correction techniques; and (3) estimate internal systematic and random error levels of the various tracking stations. The GEOS 2 satellite was used as the target vehicle. Data were obtained regarding the ionospheric and tropospheric propagation errors, the theoretical and data analysis of which was documented in some 30 separate reports over the last 6 years. An overview of project results is presented. A.R.H.

N79-16022*# Owens-Illinois, Inc., Toledo, Ohio.
STUDY OF IRON-BORATE MATERIALS SYSTEMS PROCESSED IN SPACE Final Report, 27 Sep. 1977 - 26 Sep. 1978
G. F. Neilson 16 Aug. 1978 42 p refs
(Contract NAS8-32659)
(NASA-CR-150888) Avail: NTIS HC A03/MF A01 CSCL 22A

It was calculated that an $FeBO_3B_2O_3$ glass-ceramic containing only 1 mole% $FeBO_3$ would be equivalent for magnetooptic application to a YIG crystal of equal thickness. An $Fe_2O_3B_2O_3$ composition containing 2 mole% $FeBO_3$ equivalent (98B) could be converted largely to a dense green, though opaque, $FeBO_3$ glass-ceramic through suitable heat treatments. However, phase separation (and segregation) and $Fe+3$ reduction could not be entirely avoided with the various procedures that were employed. From light scattering calculations, it was estimated that about 100 A to allow 90% light transmission through a 1 cm thick sample. However, the actual $FeBO_3$ crystallite sizes obtained in 98B were of the order of 1 micron or greater. Author

N79-16023*# Vought Corp., Dallas, Tex.
LOW ENERGY STAGE STUDY. VOLUME 4: COST BENEFITS ANALYSIS AND RECOMMENDATIONS
Aug. 1978 128 p refs
(Contract NAS8-32710)
(NASA-CR-150896; Rept-2-55910/8R-3483-Vol-4) Avail: NTIS HC A07/MF A01 CSCL 22A

The costs and benefits of existing/planned systems, new propulsion concepts, and adaptations of existing/planned systems (as supported by Orbiter interface requirements and operations requirements) were quantified. Scenarios of these propulsion approaches were established which accommodate the low energy regime as defined by the new low energy payload mission model. These scenarios were screened on a cost and then a benefits basis. A propulsion approach comprising existing/planned systems and a new propulsion concept were selected as the most cost effective approach to accommodate the model payloads and the low energy regime they represent. Key cost drivers and sensitivity trends were identified. All costs were derived in 1977 dollars. A.R.H.

N79-16024*# Vought Corp., Dallas, Tex.
LOW ENERGY STAGE STUDY. VOLUME 5: PROGRAM STUDY COST ELEMENTS AND APPENDICES
Aug. 1978 326 p refs

(Contract NAS8-32710)
(NASA-CR-150897; Rept-2-55910/8R-3483-Vol-5) Avail: NTIS HC A15/MF A01 CSCL 22A

The methodology and rationale used in the development of costs for engineering, manufacturing, testing and operating a low thrust system for placing automated shuttle payloads into earth orbits are described. Cost related information for the recommended propulsion approach is included. A.R.H.

N79-16025*# National Aeronautics and Space Administration, Washington, D. C.
APOLLO SOYUZ
Walter Froehlich [1978] 125 p Original contains color illustrations
(NASA-EP-109) Avail: NTIS MF A01; SOD HC $3.30 CSCL 22A

The mission, background, and spacecraft of the Apollo Soyuz Test Project are summarized. Scientific experiments onboard the spacecraft are reviewed, along with reentry procedures. A small biography of each of the five astronauts (U.S. and Russian) is also presented. J.A.M.

N79-16026# British Aerospace Dynamics (Space), Stevenage (England).
PHASE 1 REPORT ON SMALL EXPERIMENT MOUNT (SEM). PHASE A STUDY
J. B. Farrow, comp. Paris ESA Jun. 1978 239 p refs
(Contract ESTEC-3477/78)
(TP-7692; ESA-CR(P)-1110) Avail: NTIS HC A11/MF A01

A small experiment mount for Spacelab is described for taking payloads up to 200 - 300 kg with 10 - 20 arc seconds stability. The main object was to choose a basic configuration. Qualitative costing was included in the tradeoff leading to this choice. In particular, launch costs were compared for candidate configurations and also with IPS. A range of representative payloads was defined for use in the tradeoff. Costs relating to area occupied by the mount with its payload, were found usually to exceed those due to mass. Cumulative launch costs over the life of the mount can be expected to exceed the development cost by a wide margin. A two-axis mount with the axes outside the payload was selected, since it gave more flexible payload accommodation than a fork or girth ring arrangement. Three-axis and vernier arrangements were rejected at an early stage on cost and other grounds. J.A.M.

N79-16027# British Aerospace Dynamics Group, Bristol (England). Electronics and Space Systems.
DEFINITION STUDY OF A SPACELAB MISSION CENTERED ON GRIST Final Report
R. A. Henderson, G. T. Biddis, H. Mooney, J. Davis, D. C. Clayton, and J. Howard Paris ESA May 1978 331 p refs
(Contract ESA-3531/78-F-HEW(SC))
(ESS/SS-875; ESA-CR(P)-1137) Avail: NTIS HC A15/MF A01

The definition study of a Spacelab payload centered on GRIST (A Grazing Incidence Solar Telescope) is presented. The study objective was to show the feasibility of assembling a scientifically viable payload with a large facility instrument such as GRIST. A payload accommodation analysis was carried out, and feasibility was demonstrated. Areas of difficulty were identified and possible solutions elaborated. J.A.M.

N79-16028# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE SYNCHRONOUS MISSION ANALYSIS PROGRAM SYNMAP
M. D. Palmer and G. E. Cook Dec. 1977 109 p refs
(RAE-TR-77179; BR64247) Avail: NTIS HC A06/MF A01

The computer program SYNMAP is described which used a stochastic simulation method to determine the total velocity increment required for the station acquisition phase of a synchronous satellite orbit mission. The program took account of errors due to launch vehicle injection, satellite tracking, and apogee motor burn. The program POINT2 is also described which may be used to generate the set of random transfer orbits required by SYNMAP. J.A.M.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N79-16029# Royal Aircraft Establishment, Farnborough (England). Space Dept.
COSMOS 462 (1971-106A): ORBIT DETERMINATION AND ANALYSIS
Doreen M. C. Walker Aug. 1978 63 p refs
(RAE-TR-78089; BR64935) Avail: NTIS HC A04/MF A01

Cosmos 462 was launched on 3 December 1971 into an orbit inclined at 65.75 deg to the equator, with a perigee height of 230 km and apogee height of 1800 km, and decayed on 4 April 1975. Orbital parameters were determined at 85 epochs from 6635 radar and optical observations. The average standard deviation in eccentricity and inclination corresponded to a positional accuracy of about 100 m. Orbits of similar accuracy were determined daily for the last 15 days of the life, from 2000 NORAD observations. During its slow decay, the orbit passed through 14:1, 29:2, and 15:1 resonances with the earth's gravitational field. The variations in inclination and eccentricity at the these resonances were analyzed in detail to evaluate lumped geopotential harmonic coefficients of order 14, 29, and 15. J.A.M.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N79-16030# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Hauptabt. Festigkeit, Konstruktion und Werkstoffe.
STUDY OF MULTIDEGREE OF FREEDOM SYSTEMS FOR VIBRATING TESTING OF FUTURE LARGE SPACE OBJECTS
Schildt, Schmid, Seifferth, and Merklinghaus Paris ESA 30 May 1978 237 p refs
(Contract ESTEC-3228/NL-77-HP(SC))
(IABG-B-TF-768; ESA-CR(P)-1132) Avail: NTIS HC A11/MF A01

Techniques are discussed that may be applied to equipping six-degree-of-freedom vibration test facilities with hydraulic cylinders. It was understood that similar test facilities were constructed in the US, but none for simultaneous movement in all six degrees of freedom. A facility is operating that is capable of moving in all degrees of freedom simultaneously, but was designed to use seismic signals in its tests and, consequently, has a relatively small usable frequency range. All available information seemed to indicate that it is quite possible to construct a test facility that would meet all requirements of frequencies of up to more than 200 Hz. The servovalves, including those with the required flow rates, are available on the market. Certain difficulties, however, are anticipated with the joints because they will have to transmit very great forces without play. J.A.M.

N79-16031# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE APPLICATION AND FINAL DESIGN OF AN ION THRUSTER SIMULATOR
J. W. Pye Apr. 1978 36 p refs
(RAE-TR-78045; BR63953) Avail: NTIS HC A03/MF A01

A study of the design, development, and application of a mercury ion thruster performance simulator is presented. Although based on previous successful experimental work on the simulation of the discharge mechanism and ion beam extraction characteristics of the UK T4 thruster, the design was considerably extended to accurately represent all aspects of thruster operation relevant to station-keeping missions. These functions include all

relevant time-dependent parameters associated with thruster warmup during the starting sequence and the appropriate, performance related, loading of the various thruster power supplies. Its application is discussed in terms of satisfying a pressing requirement for a prelaunch checkout facility, when thruster operation is not practicable. It provides an independent means of assessing both the flight status of the thruster power processing and sequencing electronics and possible interactions with other spacecraft subsystems. Author

N79-16001*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES
N. A. Renzetti *In its* The Deep Space Network 15 Dec. 1978 p 1-3 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

N79-16002*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN MONITOR AND CONTROL SYSTEM, MARK 3-78
W. G. Stinnett *In its* The Deep Space Network 15 Dec. 1978 p 4-6 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

N79-16004*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PIONEER VENUS MISSION SUPPORT
A. C. Bouck *In its* The Deep Space Network 15 Dec. 1978 p 12-14 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

N79-16005*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HELIOS MISSION SUPPORT
P. S. Goodwin, W. N. Jensen, and G. M. Rockwell *In its* The Deep Space Network 15 Dec. 1978 p 15-17 ref (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-16032*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NIMBUS 6 DOPPLER PROCESSING USING THE FAIRBANKS CALIBRATION PLATFORM
D. W. Koch and Joan G. Lefler (Old Dominion Systems, Inc., Gaithersburg, Md.) Oct. 1978 18 p refs Submitted for publication
(NASA-TM-79678) Avail: NTIS HC A02/MF A01 CSCL 22B

A weighted least squares processor is examined. Research conducted in support of the NASA satellite aided Search and Rescue program is presented. An estimated NIMBUS 6 ephemeris, accurate to 1.5-2.5 km and 0.5-2.5 m/s relative to a reference orbit, is obtained during the three day signal transmission period. This suggests updating the knowledge of the relay satellite ephemeris by one reference beacon is needed during the Search and Rescue demonstration. S.E.S.

N79-16033*# Sigma Corp., Houston, Tex.
EDIN0621B SIZING AND PERFORMANCE RESULTS Interim Report
Guy N. Hirsch Jul. 1976 34 p refs
(Contract NAS9-14520)
(NASA-CR-151906; TN-76-118) Avail: NTIS HC A03/MF A01 CSCL 22B

A launch vehicle was investigated for the Solar Power Satellite System (SPS). The technology level assumed for sizing was that predicted for 1995. The candidate concept designated EDIN0621B is a two stage, winged, series burn vehicle capable of delivering a one million pound payload to low earth orbit. A propulsion system was sized to provide payload circularization at apogee. Any docking, rendezvous or additional Delta V requirements were assumed to be integral to the payload. The EDIN0621B concept used LOX/C3H8 booster engines and uprated Shuttle System main engines in the upper stage. Gross liftoff weight of the baseline vehicle was 18,367,853 pounds. The booster stage required thirteen engines; the upper stage required seven. The vehicle was designed to a liftoff thrust to weight ratio of 1.3. L.S.

N79-16034*# Sigma Corp., Houston, Tex.
STRUCTURAL SIZING OF THE EDIN0620 BODY COMPONENTS USING THE APAS STRUCTURAL SYNTHESIS COMPUTER PROGRAM Final Report
William E. Nolte Jul. 1976 28 p refs
(Contract NAS9-14520)
(NASA-CR-151907; TN-76-119) Avail: NTIS HC A03/MF A01 CSCL 22B

The use of a structural synthesis computer program to design components for a heavy lift launch vehicle is defined. A loads program was used to determine the vehicle shears, bending moments, and axial loads at two design loading conditions. A comparison was made between results from the structures program and the results of a weight estimating program which used historical data in determining component weights. J.M.S.

N79-16035*# Rockwell International Corp., Downey, Calif. Space Division.
ADVANCED TECHNOLOGY REQUIREMENTS FOR LARGE SPACE STRUCTURES. PART 5: ATLAS PROGRAM REQUIREMENTS Final Report
E. Katz, A. N. Lillenas, and J. A. Broddy Sep. 1977 99 p
(Contract NAS1-14116)
(NASA-CR-159014; SD-77-AP-0162-Pt-5) Avail: NTIS HC A05/MF A01 CSCL 22B

The results of a special study which identifies and assigns priorities to technology requirements needed to accomplish a particular scenario of future large area space systems are described. Proposed future systems analyzed for technology requirements included large Electronic Mail, Microwave Radiometer, and Radar Surveillance Satellites. Twenty technology areas were identified as requirements to develop the proposed space systems. G.Y.

N79-16036*# Rockwell International Corp., Downey, Calif. Space Div.
SATELLITE POWER SYSTEMS (SPS) CONCEPT DEFINITION STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
G. Hanley Apr. 1978 88 p 7 Vol.
(Contract NAS8-32475)
(NASA-CR-150700; SD-78-AP-0023-1-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 22B

The evolution of a total satellite power is described as well as major subsystem alternatives. Trade study results are given for satellite concepts, ground receiving antennas, satellite construction sites, and transportation. Point design definition, end-to-end analysis, and programmatics are covered. The GaAlAs photovoltaic concept is recommended as the current preliminary baseline satellite concept with silicon photovoltaic and Rankine cycle solar-thermal concepts as viable alternatives. Geosynchronous orbit is preferred for the construction of the satellite. A horizontal takeoff and landing air breathing rocket HLLV concept is preferred for earth-to-LEO transportation, with vertical takeoff options as viable alternatives. An argon electric orbit transfer vehicle is preferred for cargo transport frow LEO and GEO orbit, and a chemical LH2/LO2, two-stage orbit transfer vehicle is recommended for crew transport. A stripline rectenna array is the current preferred concept. A.R.H.

N79-16037*# Rockwell International Corp., Downey, Calif. Space Div.
SATELLITE POWER SYSTEMS (SPS) CONCEPT DEFINITION STUDY. VOLUME 2: SPS SYSTEM REQUIREMENTS Final Report
G. Hanley Apr. 1978 93 p 7 Vol.
(Contract NAS8-32475)
(NASA-CR-150681; SD-78-AP-0023-2-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 22B

Collected data reflected the level of definition resulting from the evaluation of a broad spectrum of SPS (satellite power systems) concepts. As the various concepts matured, these requirements were updated to reflect the requirements identified

for the projected satellite system/subsystem point design(s). The study established several candidate concepts which were presented to provide a basis for the selection of one or two approaches that would be given a more comprehensive examination. The two selected concepts were expanded and constitute the selected system point designs. The identified system/subsystem requirements was emphasized and information on the selected point design was provided. Author

N79-16038*# IBM Federal Systems Div., Huntsville, Ala. Command and Space Systems.
POWER MODULE DATA MANAGEMENT SYSTEM (DMS) STUDY Final Report, 15 May 1978 - 1 Dec. 1978
30 Nov. 1978 144 p
(Contract NAS8-31747)
(NASA-CR-150883; K42-78-001) Avail: NTIS HC A07/MF A01 CSCL 22B

Computer trades and analyses of selected Power Module Data Management Subsystem issues to support concurrent inhouse MSFC Power Study are provided. The charts which summarize and describe the results are presented. Software requirements and definitions are included. S.E.S.

N79-16039*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical and Systems Engineering.
SOLAR POWER SATELLITE RECTENNA DESIGN STUDY: DIRECTIONAL RECEIVING ELEMENTS AND PARALLEL-SERIES COMBINING ANALYSIS Final Report, 3 Feb. 1978 - 1 Dec. 1978
Ronald J. Gutmann and Jose M. Borrego Dec. 1978 123 p refs
(Contract NAS9-15453)
(NASA-CR-151866) Avail: NTIS HC A06/MF A01 CSCL 22B

Rectenna conversion efficiencies (RF to dc) approximating 85 percent were demonstrated on a small scale, clearly indicating the feasibility and potential of efficiency of microwave power to dc. The overall cost estimates of the solar power satellite indicate that the baseline rectenna subsystem will be between 25 to 40 percent of the system cost. The directional receiving elements and element extensions were studied, along with power combining evaluation and evaluation extensions. J.A.M.

N79-16040*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SAIL FILM MATERIALS AND SUPPORTING STRUCTURE FOR A SOLAR SAIL, A PRELIMINARY DESIGN, VOLUME 4
W. M. Rowe, ed. Oct. 1978 270 p refs
(NASA-CR-157870; JPL-720-9-Vol-4) Avail: NTIS HC A12/MF A01 CSCL 22B

Solar sailing technology was examined in relation to a mission to rendezvous with Halley's Comet. Development of an ultra-light, highly reflecting material system capable of operating at high solar intensity for long periods of time was emphasized. Data resulting from the sail materials study are reported. Topics covered include: basic film; coatings and thermal control; joining and handling; system performance; and supporting structures assessment for the heliogyro. J.M.S.

N79-16041# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronic and Space Systems Group.
OUT-OF-ECLIPTIC USING ARIANE LAUNCHE VEHICLE. VOLUME 1: EXECUTIVE SUMMARY Final Report, Phase A Study
J. Simpson, J. Howard, P. Braund, B. Pugh, R. Slade, L. Virdee, T. Morley, and K. Harding Paris ESA Nov. 1977 59 p 4 Vol.
(Contract ESA-3233/77-F-HGE(SC))
(ESS/SS-845-Vol-1; ESA-CR(P)-1136-Vol-1) Avail: NTIS HC A04/MF A01

The work carried out on a phase A study of an out-of-ecliptic mission using the Ariane launch vehicle is reported. It comprises a single spacecraft with a model experiment payload similar to payload A of the earlier phase A studies, and uses a Delta Vega orbit to provide an adequate spacecraft mass for injection into the transfer orbit to Jupiter. This feature increases the complexity of the spacecraft by the addition of a 400 N bi-propellant rocket motor and increases the overall mission duration from launch to recrossing the ecliptic plane after solar passage to nearly 6 years. Using May 1983 launch opportunity, it is concluded that a useful payload could be carried which achieves a maximum heliographic latitude of about 70 deg, for a phase C/D industrial development program cost of about 38 MAU at mid 1975 rates. Author (ESA)

N79-16042# British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronic and Space Systems Group.
OUT-OF-ECLIPTIC USING ARIANE LAUNCH VEHICLE. VOLUME 2: SYSTEMS STUDIES Final Report, Phase A Study
J. Simpson, J. Howard, B. Garner, T. Morley, and K. Harding Paris ESA Nov. 1977 203 p refs 4 Vol.
(Contract ESA-3233/77-F-HGE(SC))
(ESS/SS-845-Vol-2; ESA-CR(P)-1136-Vol-2) Avail: NTIS HC A10/MF A01

System level aspects of an out-of-ecliptic mission using the Ariane launch vehicle are discussed. They include: mission analysis and overall mission performance; configuration selection and description of the preferred solution; overall mass and power budgets; reliability analysis; radiation levels and protection; development plan; and cost estimates. It is concluded that a spacecraft using predominantly European hardware, but excluding the RTG, could be developed for a cost of some 38 MAU at mid 1975 rates (Phase C/D) to achieve a maximum heliographic latitude of just under 70 deg, using a Delta Vega type orbit, giving a total mission lifetime of about 6 years. Author (ESA)

N79-16043# British Aircraft Corp. (Operating) Ltd., Bristol (England).
OUT-OF-ECLIPTIC USING ARIANE LAUNCH VEHICLE. VOLUME 3: SUBSYSTEM STUDIES Final Report, Phase A Study
J. Simpson, J. Howard, P. Braund, B. Pugh, R. Slade, L. Virdee, K. Harding, and T. Morley Paris ESA Nov. 1977 177 p 4 Vol.
(Contract ESA-3233/77-F-HGE(SC))
(ESS/SS-845-Vol-3; ESA-CR(P)-1136-Vol-3) Avail: NTIS HC A05/MF A01

Subsystem level aspects of the out-of-ecliptic mission using the Ariane launch vehicle are discussed. The following items are covered: propulsion systems; structure; attitude and orbit control system; telecommunications; data handling; thermal control; booms; and power. The subsystem philosophy adopted makes extensive use of that developed in previous studies, but the opportunity has been taken to re-assess these, and there are some significant changes as a result of the Ariane based mission requirements. Author (ESA)

N79-16044# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
OUT-OF-ECLIPTIC USING ARIANE LAUNCH VEHICLE. APPENDIX: AUXILIARY PROPULSION SYSTEM (APS) Final Report, Phase A Study
Paris ESA Nov. 1977 76 p Prepared for Brit. Aircraft Corp. 4 Vol.
(Contract ESA-3233/77-F-HGE (SC))
(ESS/SS-845-App; ESA-CR(P)-1136-App) Avail: NTIS HC A05/MF A01

A proposal is presented for the auxiliary propulsion system of an out-of-ecliptic spacecraft launched by Ariane launch vehicle. Design is based on the apogee boost motor and the reaction control system used for the Symphonie satellites. Based on work done for the Jupiter orbiter mission, the lifetime for the propulsion system with one 400-N engine and twelve 10-N engines is assessed as being 6 years for the intended mission. ESA

N79-16045# European Space Agency, Paris (France).
BENEFIT COST STUDY MINIMETSAT: AN EXAMPLE OF THE ADAPTATION OF AN EVALUATION PROCESS
Joachim Majus Dec. 1978 33 p refs Transl. into ENGLISH of 'Nutzen-Kosten-Untersuch. Minimetsat: Beispiel fuer die Anpassung eines Bewertungsverfahrens', DFVLR, Cologne Report DLR-FB-77-62, 10 Mar. 1978 Original German report available from DFVLR, Cologne DM 14.20
(ESA-TT-526; DLR-FB-77-62) Avail: NTIS HC A03/MF A01

A selection from complex alternatives can be made by means of a benefit cost study. The decision can be simplified by dividing it into many single quantitative judgments; but the procedures for carrying out such studies are limited by conditions which can hardly be realized in practice. A subjective evaluation process is proposed which, taking into account these conditions, can be applied with a reasonable effort. When studying the mission alternatives for the small meteorological satellite Minimetsat, not all the conditions could be realized. The evaluation method was therefore adapted to the characteristics of the case under considerations. The result obtained was both methodologically justified and accepted by the evaluators. Author (ESA)

N79-16046# European Space Agency, Paris (France).
SPACELAB PAYLOAD ACCOMMODATION HANDBOOK. MAIN VOLUME
Jul. 1978 569 p Prepared jointly with Ver. Flugtech. Werke Fokker
(NASA-TM-79937; ESA-SLP/2104-Issue-1) Avail: NTIS HC A24/MF A01 CSCL 22B

The main characteristics of the Spacelab system are described to enable individual experimenters or payload planning groups to determine how their payload equipment can be accommodated by Spacelab. Spacelab/experiment interfaces, Spacelab payload support systems and requirements that the experiments have to comply with are described to allow experiment design and development. The basic operational aspects are outlined as far as they have an impact on experiment design. The relationship of the Spacelab Payload Accommodation Handbook to Space Transportation System documentation is outlined. Data concerning the space shuttle system are briefly described. J.M.S.

N79-16047# European Space Agency, Paris (France).
SPACELAB PAYLOAD ACCOMMODATION HANDBOOK. APPENDIX A: AVIONICS INTERFACE DEFINITION
Jul. 1978 208 p
(NASA-TM-79938; ESA-SLP/2104-1-Issue-1) Avail: NTIS HC A10/MF A01 CSCL 22B

The Spacelab side of the electrical interface between Spacelab subsystem equipment and experiments is presented. The electrical hardware which interfaces with the experiments is defined and the signal/load characteristics are stated. Major subsystems considered include: electrical power and distribution; command and data management subsystem; orbiter avionics via dedicated connectors of Spacelab; and electrical ground support equipment. J.M.S.

N79-16048# European Space Research and Technology Center, Noordwijk (Netherlands). Data Handling and Signal Processing Div.
ESA SATELLITE CHECKOUT. INTRODUCTION
Paris ESA Jul. 1978 21 p Prepared jointly with Tech. Manuals, Training and Reprographic Serv. Ltd.
(ESA-SP-1008) Avail: NTIS HC A02/MF A01

An established test concept incorporated the procedures and experience accumulated by ESA and its industrial partners over more than 14 years of operations. Proven performance provided reliable means for effective quality control. Comprehensive service provided equipment software, documentation, and operational support. Standard high level test language enabled users to generate test sequences, without computer programming experience. Known cost allowed integration and test activities to be reliably budgetted. Soft obsolescence and evolution rather than total equipment write-off was made possible through standardization and modular construction. J.A.M.

N79-16049# European Space Research and Technology Center, Noordwijk (Netherlands).
A COMPUTER PROGRAM FOR THE SIMULATION OF THE REPLENISHMENT PROCEDURE FOR A SATELLITE-BASED COMMUNICATION SYSTEM
H. Viehman and B. L. Kristensen Paris ESA Apr. 1978 36 p
(ESA-STM-201) Avail: NTIS HC A03/MF A01

A computer program is described by which the sequence of launches can be simulated that is required for the installation and maintenance of a satellite-based communication system. A 'Monte Carlo' method is used for the generation of random events. Details of the satellite functional model, reliability model, allocation of resources to requirements, and decision rules are given. Author

N79-16050# British Aerospace Dynamics Group, Bristol (England). Electronic and Space Systems.
THE ADAPTATION OF SOUNDING ROCKET TECHNOLOGY FOR SPACELAB SUBSATELLITES. VOLUME 1: TECHNICAL REPORT Final Report of Phase A Study
P. R. Voke, S. A. Osborn, A. Derrick, B. Pugh, I. McVicar, P. M. Addison, M. W. Letts, and R. W. Lines Paris ESA Jun. 1978 118 p refs
(Contract ESA-3434/77-F-HGE(SC))
(ESS/SS-870; ESA-CR(P)-1113) Avail: NTIS HC A06/MF A01

A baseline design is described which offers the following facilities for experiments: volume - 25 cu dm, mass - 24 kg, power - 16 W, data rate - 16 kb/s at 16 km range, and operating life - 5 hours. Various optional uprating modules are described which improve these facilities and provide additional services. A spin up, release and ejection table (SURET) is also described. The cost of the baseline subsatellite bus is close to the target cost set by ESA of 250 KAU, based on a batch of 10 off. J.A.M.

N79-16051# Royal Aircraft Establishment, Farnborough (England). Space Dept.
REVISED TABLE OF EARTH SATELLITES, VOLUME 1: 1957 TO 1968
D. G. King-Hele, H. Hiller, and J. A. Pilkington Jan. 1978 203 p refs
(RAE-TR-78012; BR63010) Avail: NTIS HC A10/MF A01

A listing of 768 satellite launches, arranged chronologically is presented. For each launch, the name and international designation of each instrumented satellite and final-stage rocket is given with the date of launch, lifetime (actual or estimated), mass, shape, dimensions and at least one set of orbital parameters. Other fragments associated with a launch are listed without these details. J.M.S.

N79-16052# Royal Aircraft Establishment, Farnborough (England). Space Dept.
TABLE OF SPACE VEHICLES: 1973-1977
J. A. Pilkington Feb. 1978 19 p Supersedes RAE-TM-242 (RAE-TM-Space-256; BR62460; RAE-TM-Space-242) Avail: NTIS HC A02/MF A01

All space vehicles are listed that were successfully launched up to the end of 1977. G.G.

N79-16053# Centre National d'Etudes Spatiales, Toulouse (France).
GEOLE SYSTEM SYNTHESIS REPORT
J. P. Catani 24 Mar. 1977 51 p In FRENCH; ENGLISH summary
Avail: NTIS HC A04/MF A01

The results of the definition studies of the GEOLE satellite-based positioning system are given. The missions assigned to the system are outlined. Various operation schemes showing the adaptability of the original concept are described. J.M.S.

N79-16003*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VIKING CONTINUATION MISSION SUPPORT
R. L. Gillette *In its* The Deep Space Network 15 Dec. 1978 p 7-11 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 22D

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N79-16054*# Battelle Columbus Labs., Ohio.
STUDY OF MULTIMISSION MODULAR SPACECRAFT (MMS) PROPULSION REQUIREMENTS

N. H. Fischer and A. E. Tischer 8 Aug. 1977 240 p refs
(Contract NAS7-786)
(NASA-CR-159919) Avail: NTIS HC A11/MF A01 CSCL 22B

The cost effectiveness of various propulsion technologies for shuttle-launched multimission modular spacecraft (MMS) missions was determined with special attention to the potential role of ion propulsion. The primary criterion chosen for comparison for the different types of propulsion technologies was the total propulsion related cost, including the Shuttle charges, propulsion module costs, upper stage costs, and propulsion module development. In addition to the cost comparison, other criteria such as reliability, risk, and STS compatibility are examined. Topics covered include MMS mission models, propulsion technology definition, trajectory/performance analysis, cost assessment, program evaluation, sensitivity analysis, and conclusions and recommendations. A.R.H.

N79-16055*# Northrop Services, Inc., Huntsville, Ala. Engineering and Technology Group.
SPACE SHUTTLE PLUME SIMULATION APPLICATION. RESULTS AND MATH MODEL Final Report
W. Boyle and B. Conine 28 Jul. 1978 209 p refs
(Contract NAS8-32524)
(NASA-CR-150889) Avail: NTIS HC A10/MF A01 CSCL 21H

Pressure and gauge wind tunnel data from a transonic test of a 0.02 scale model of the space shuttle launch vehicle was analyzed to define the aerodynamic influence of the main propulsion system and solid rocket booster plumes during the transonic portion of ascent flight. Air was used as a simulant gas to develop the model exhaust plumes. A math model of the plume induced aerodynamic characteristics was developed for a range of Mach numbers to match the forebody aerodynamic math model. The base aerodynamic characteristics are presented in terms of forces and moments versus attitude. Total vehicle base and forebody aerodynamic characteristics are presented in terms of aerodynamic coefficients for Mach number from 0.6 to 1.4 Element and component base and forebody aerodynamic characteristics are presented for Mach numbers of 0.6, 1.05, 1.1, 1.25 and 1.4. The forebody data is available at Mach 1.55. Tolerances for all plume induced aerodynamic characteristics are developed in terms of a math model. A.R.H.

N79-16056*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE Interim Review No. 1
27 Jun. 1978 252 p
(Contract NAS9-15507)
(NASA-CR-151870; NSS-MR-RP-006) Avail: NTIS HC A12/MF A01 CSCL 22B

The two prime objectives of the Manned Remote Work Station (MRWS) Development Article Study are to first, evaluate the MRWS flight article roles and associated design concepts for fundamental requirements and embody key technology developments into a simulation program; and to provide detail manufacturing drawings and schedules for a simulator development test article. An approach is outlined which establishes flight article requirements based on past studies of Solar Power Satellite, orbital construction support equipments, construction bases and near term shuttle operations. Simulation objectives are established for those technology issues that can best be addressed on a simulator. Concepts for full-scale and sub-scale simulators are then studied to establish an overall approach to studying MRWS requirements. Emphasis then shifts to design and specification of a full-scale development test article. G.Y.

N79-16057*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE Interim Review No. 2
8 Nov. 1978 260 p
(Grant NAS9-15507)
(NASA-CR-151871; NSS-MR-RP-011) Avail: NTIS HC A12/MF A01 CSCL 22B

Flight article and associated design concepts are evaluated to meet fundamental requirements of a universal crew cabin to be used as a construction cherrypicker, a space crane turret, a railed work station, or a free flyer. Key technology developments are embodied into a simulation program. A schedule and simulation test plan matrix is given for the open cabin cherry picker. A.R.H.

N79-16058*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY DOCUMENTATION. VOLUME 1: EXECUTIVE SUMMARY Final Report
Dec. 1978 31 p
(Contract NAS9-15532)
(NASA-CR-151877; MDC-G7555-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22B

Potentially feasible system concepts for providing additional power, thermal control, and attitude to the baseline orbiter were investigated in order to support a greater variety of space missions and to extend the orbiter's ability to remain in orbit. Results of these analyses include an incremental growth plan that offers the flexibility of adding capability as, and when, it is needed in order to satisfy emerging user requirements. J.M.S.

N79-16059*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY DOCUMENTATION. VOLUME 2: TECHNICAL REPORT Final Report
Dec. 1978 179 p
(Contract NAS9-15532)
(NASA-CR-151878; MDC-G7555-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22B

Near term, cost effective concepts were defined to augment the power and duration capability offered to shuttle payload users. Feasible concept options that could evolve to provide free-flying power and other services to users in the 1984 time frame were also examined. J.M.S.

N79-16060# Committee on Science and Technology (U. S. House).
SPACE SHUTTLE, 1979
Darrell R. Branscome, Daniel E. Cassidy, Gerald E. Jenks, and James E. Wilson Washington GPO 1978 676 p refs Status Rept. for Comm. on Sci. and Technol., 95th Congr., 2d Sess., Dec. 1978
(GPO-36-480) Avail: SOD HC

The current status of the space shuttle system and its costs, performance, and schedule is assessed in reports provided by NASA during program review hearings and field visits to NASA centers and key industrial contractors. Current management and technical issues which must be mastered to reach the goal of a first orbital flight in 1979 are discussed. Recommendations of the National Academy of Engineering's Ad Hoc Committee for the review of the shuttle main engine development program are summarized as well as those of the Aerospace Safety Advisory Panel. A.R.H.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N79-16061# National Technical Information Service, Springfield, Va.
BIOTELEMETRY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1970 - Nov. 1978
Elizabeth A. Harrison Dec. 1978 141 p Supersedes NTIS/PS-77/1120; NTIS/PS-76/1020; NTIS/PS-75/855; NTIS/PS-75/094
(NTIS/PS-78/1269/6; NTIS/PS-77/1120; NTIS/PS-76/1020; NTIS/PS-75/855; NTIS/PS-75/094) Avail: NTIS HC $28.00/MF $28.00 CSCL 06B

The bibliography cites Federally sponsored research reports

which discuss biomedical information systems, biometeorology, animal and bird migrations, bioinstrumentation, electrocardiography, ecology, and electroencephalography as related to biotelemetry. This updated bibliography contains 234 abstracts, 18 are new entries to the previous edition. GRA

N79-16062# National Technical Information Service, Springfield, Va.
BIOTELEMETRY, VOLUME 1. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Dec. 1977
Elizabeth A. Harrison Dec. 1978 263 p Supersedes NTIS/PS-77/1121; NTIS/PS-76/1021
(NTIS/PS-78/1270/4; NTIS/PS-77/1121; NTIS/PS-76/1021) Avail: NTIS HC $28.00/MF $28.00 CSCL 06B

Citations of worldwide research are covered in this bibliography on biotelemetry. Included are studies on the use of biotelemetry in biomedical information systems, biometeorology, animal and bird migrations, bioinstrumentation, electrocardiography, ecology, and electroencephalography. The updated bibliography contains 257 abstracts. GRA

N79-16063# National Technical Information Service, Springfield, Va.
BIOTELEMETRY, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Jan. - Nov. 1978
Elizabeth A. Harrison Dec. 1978 42 p Supersedes NTIS/PS-77/1121; NTIS/PS-76/1021
(NTIS/PS-78/1271/2; NTIS/PS-77/1121; NTIS/PS-76/1021) Avail: NTIS HC $28.00/MF $28.00 CSCL 06B

Citations of worldwide research are covered in this bibliography on biotelemetry. Included are studies on the use of biotelemetry in biomedical information systems, biometeorology, animal and bird migrations, bioinstrumentation, electrocardiography, ecology, and electroencephalography. This updated bibliography contains 35 abstracts all of which are new entries to the previous edition. GRA

N79-16006*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CONVOLUTIONAL CODING RESULTS FOR THE MVM '73 X-BAND TELEMETRY EXPERIMENT
J. W. Layland *In its* The Deep Space Network 15 Dec. 1978 p 18-21 refs (For primary document see N79-16000 07-12) Avail: NTIS HC A07/MF A01 CSCL 17B

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N79-16064# Engins Matra, Velizy (France).
IMPLEMENTATION STUDY OF AN ATTITUDE AND ORBIT CONTROL SUBSYSTEM USING AN ADAPTIVE CONTROL ELECTRONICS. VOLUME A: DESIGN OF A MODULAR ATTITUDE AND ORBIT CONTROL SUBSYSTEM Final Report
M. Germain, R. Havas, F. Mariau, N'guyen, J. Soubirou, C. Vialet, J. Gillon (Centre d'Etudes et de Rech., Toulouse), and R. Mampey (Centre d'Etudes et de Rech., Toulouse) Paris ESA May 1978 201 p 5 Vol.
(Contract ESTEC-2741/76-AK)
(Rept-30/938/0-Vol-1; ESA-CR(P)-1105-Vol-1) Avail: NTIS HC A10/MF A01

Implementation concepts are discussed for the attitude and orbit control subsystems using adaptive control electronics. A modular architecture was derived aiming at a cost effective subsystem development and fabrication. The new MACS (Modular Attitude and Orbit Control Subsystem) implementation approach was used to suppress mission dependent hardware, to shorten development and fabrication time duration, and to simplify subsystem test procedure and equipment. The MACS is composed of a power and multiplexed data bus harness connecting the adoptive control electronics, a monitor and controller assembly, and standard MACS components selected for each satellite project according to mission requirements. A computer simulation was performed to validate the MACS functional guidelines and ACE requirements definition. G.G.

N79-16065# Engins Matra, Velizy (France).
IMPLEMENTATION STUDY OF AN ATTITUDE AND ORBIT CONTROL SUBSYSTEM USING AN ADAPTIVE CONTROL ELECTRONICS. VOLUME B: MODULAR ATTITUDE AND ORBIT CONTROL SUBSYSTEM HANDBOOK Final Report
M. Germain, R. Havas, F. Mariau, N'guyen, J. Soubirou, C. Vialet, J. Gillon (Centre d'Etudes et de Rech., Toulouse), and R. Mampey (Centre d'Etudes et de Rech., Toulouse) Paris ESA May 1978 142 p 2 Vol.
(Contract ESTEC-2741/76-AK)
(Rept-30/938/0-Vol-2; ESA-CR(P)-1105-Vol-2) Avail: NTIS HC A07/MF A01

To provide the inherent capability to meet a large variety of multimode and multimission performance requirements, without hardware development and fabrication dedicated to a specific mission, this handbook describes a new approach of designing, developing, fabricating and testing attitude and orbit control subsystem. The proposed concept, which aimed at overall cost effectiveness optimization, was defined by architecture and interface guidelines, and gave birth to the modular attitude and orbit control subsystem. J.A.M.

N79-16066# Engins Matra, Velizy (France).
IMPLEMENTATION STUDY OF AN ATTITUDE AND ORBIT CONTROL SUBSYSTEM USING AN ADAPTIVE CONTROL ELECTRONICS. VOLUME C: MODULAR ATTITUDE AND ORBIT CONTROL SUBSYSTEM APPLICATION TO OTS, ECS, EXOSAT Final Report
M. Germain, R. Havas, F. Mariau, N'guyen, J. Soubirou, C. Vialet, J. Gillon (Centre d'Etudes et de Rech., Toulouse), and R. Mampey (Centre D'Etudes et de Rech., Toulouse) Paris ESA May 1978 191 p 5 Vol.
(Contract ESTEC-2741/76-AK)
(Rept-30/938/0-Vol-3; ESA-CR(P)-1105-Vol-3) Avail: NTIS HC A09/MF A01

Application of the modular attitude and orbit control subsystem to OTS, ECS, and EXOSAT is considered. Telemetry organization and data and signal interface are among the topics studied. A preliminary design of the hardware indicates realistic estimates of mass and power. J.M.S.

N79-16067# Engins Matra, Velizy (France).
IMPLEMENTATION STUDY OF AN ATTITUDE AND ORBIT CONTROL SUBSYSTEM USING AN ADAPTIVE CONTROL ELECTRONICS. VOLUME D: MODULAR ATTITUDE AND ORBIT CONTROL SUBSYSTEM DETAILED APPLICATION TO SPOT Final Report
M. Germain, R. Havas, F. Mariau, N'guyen, J. Soubirou, C. Vialet, J. Gillon (Centre d'Etudes et de Rech., Toulouse), and R. Mampey (Centre d'Etudes et de Rech., Toulouse) Paris ESA May 1978 274 p 5 Vol.
(Contract ESTEC-2741/76-AK)
(Rept-30/938/0-Vol-4; ESA-CR(P)-1105-Vol-4) Avail: NTIS HC A12/MF A01

The effects of new implementation guidelines on the maintenance of the dynamic characteristics and performance of existing attitude orbit control systems are demonstrated. Methods for matching the modular attitude control system (MACS) concept to the requirements of the SPOT mission and the achievement of precision earth-pointing control were investigated. The modular attitude control system was applied to OTS, ECS, EXOSAT, and SPOT attitude and orbit control subsystems. For the SPOT mission, a computer simulation was performed to verify ACE characteristics and subsystem management guidelines. The main conclusions of the SPOT computer simulation are: (1) the computational power of an 8 bit microprocessor is sufficient to implement the SPOT AOCS attitude control, monitoring, and management tasks; (2) memory requirements were underestimated in the design phase by a fracture of 30% to 50%; (3) the INTELLEC MDS

system is an essential tool to develop cost effective application software; and (4) a SAFE/STAND BY mode is recommended for MACS component operation. A.R.H.

N79-16068# Engins Matra, Velizy (France).
IMPLEMENTATION STUDY OF AN ATTITUDE AND ORBIT CONTROL SUBSYSTEM USING AN ADAPTIVE CONTROL ELECTRONICS. VOLUME E: MODULAR ATTITUDE AND ORBIT CONTROL SUBSYSTEM DETAILED APPLICATION TO SPOT, ANNEXES 4 AND 5 Final Report
M. Germain, R. Havas, F. Mariau, N'guyen, J. Soubirou, C. Vialet, J. Gillon (Centre d'Etudes et de Rech., Toulouse), and R. Mampey (Centre d'Etudes et de Rech., Toulouse) Paris ESA May 1978 247 p 5 Vol.
(Contract ESTEC-2741/76-AK)
(Rept-30/938/0-Vol-5; ESA-CR(P)-1105-Vol-5) Avail: NTIS HC A11/MF A01

Routine used in the simulation of the SPOT mission (precision earth pointing control) are presented. A.R.H.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N79-16069*# Lockheed Missiles and Space Co., Huntsville, Ala.
INVESTIGATION OF JET EXHAUST AND LOCAL MACH NUMBER EFFECTS ON THE SOLID ROCKET BOOSTER (SRB) BASE PRESSURES (FA19) Final Report
Don A. Love Jan. 1978 135 p refs
(Contract NAS8-29752)
(NASA-CR-150903; LMSC-HREC-TR-D568157) Avail: NTIS HC A07/MF A01 CSCL 21H

Two single nozzles with flare angles of 10 and 20 degrees were tested at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48 in the presence of gaseous plumes. An attempt was made to determine the local Mach number above the flare by utilizing a pitot probe. This objective was only partially satisfied because the 20 degree flare separated the flow ahead of the flare for Mach numbers of 0.5 to 1.96. An accurate local Mach number could not be determined because of the separated flow. To meet the objective of a data base as a function of freestream Mach number, model surface and base pressures were obtained in the presence of gaseous plumes for a matrix of chamber pressures and temperatures at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48. G.G.

N79-16070# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE USE OF ION THRUSTERS FOR ORBIT RAISING
D. G. Fearn Jun. 1978 32 p refs
(RAE-TR-78068; BR64931) Avail: NTIS HC A03/MF A01

Earlier analytical results for changing the orbital altitude of a spacecraft, using a tangentially thrusting electric propulsion system, were employed to confirm that the mass of propellant required to attain a geostationary orbit is only a very small fraction of the initial mass of the satellite. However, such an orbit transfer technique requires a relatively long period of time compared with chemical propulsion, typically 100 to 300 days, and, for spacecraft masses of 1000 kg or more, multi-kW solar arrays are necessary. Unfortunately, the long transfer time also leads to a significant degradation of the power produced by these solar arrays, owing to the impact on them of energetic particles while traversing the earth's radiation belts. Nevertheless, it is concluded that this technique for maneuvering a satellite into synchronous orbit can offer attractive economic benefits for two broad classes of spacecraft. These are relatively small satellites, of 1000 kg or less, for which a dedicated ion thruster system can be advocated, and much larger devices, for which a reusable solar electric tug vehicle having its own solar arrays would be appropriate. Author

N79-16071# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
COMPUTER PROGRAMS TO CALCULATE CHEMICALLY REACTING FLOW IN AXISYMMETRIC NOZZLES
Jane M. Cousins May 1978 51 p refs
(PERME-TR-84; BR62924) Avail: NTIS HC A04/MF A01

A set of computer programs is described which calculates the inviscid two-dimensional expansion of gaseous exhaust mixtures through rocket nozzles. Equilibrium chemistry in the combustion chamber and as far as the nozzle throat is assumed. Finite rate or frozen chemistry may be applied from the throat onwards. The transonic flow field is calculated by the method of streamline curvature and the flow in the supersonic region of the nozzle is solved by the method of characteristics. The theory on which the programs are based is summarized and comprehensive user's guide is included. A sample calculation is presented. A.R.H.

N79-16072# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
CURRENT TECHNIQUES FOR THRUST MEASUREMENT AT PERME WESTCOTT
D. S. Dean Feb. 1978 98 p ref
(PERME-TR-50; BR61445) Avail: NTIS HC A05/MF A01

Techniques are described for the accurate measurement of axial thrust and thrust alignment of rocket motors, although the principles are applicable to force measurement in any other field. The dynamic response of systems is considered and techniques are described by which this may be adapted to give a linear characteristic to well above the natural frequency of the rig. This includes both amplitude and phase response. For simpler systems a method of evaluating and predicting response to linear ramp functions is derived. A ballistic technique for recording total impulse and the thrust/time curves of motors with very short burning times, which avoids most of the problems associated with the use of ballistic pendula is described. The principles are applicable to the measurement of other quantities in addition to thrust. J.M.S.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-16073# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
GUIDELINES FOR SPACE MATERIALS SELECTION
Paris ESA Jul. 1978 175 p
(ESA-PSS-07-(QRM-01)-Issue-4) Avail: NTIS HC A08/MF A01

This specification gives a brief review of the different classes of materials used in spacecraft manufacture, describes their chemical nature and physical aspects and gives some consideration to their processing and assembly methods. Precautions to be taken and materials to be avoided are emphasized for each class. General effects of the space environment are also described. Some individual materials which are suitable for space application under certain conditions are mentioned. L.S.

24 COMPOSITE MATERIALS

Includes laminates.

N79-16074 Case Western Reserve Univ., Cleveland, Ohio.
FATIGUE PERFORMANCE CHARACTERISTICS AND FATIGUE LIFE LIMITATIONS OF FIBERGLASS COMPOSITES Ph.D. Thesis
Hong Chul Kim 1978 186 p
Avail: Univ. Microfilms Order No. 7901524

The onset of permanent fatigue damage occurs by fiber surface flaw propagation. A combination of stiffness measurement and the measurement of the change in hysteresis loop energy during fatigue cycling proved to be the most accurate measure for detecting the onset of fatigue resistance of fiberglass reinforced polymers in the tension-tension axial fatigue and the bending fatigue of flexural failure mode, the matrix shear cracking was found to be the life-limiting mechanism in the bending fatigue of shear failure mode. The fiberglass embedded in the polymeric matrix appeared to fail by water vapor stress corrosion at the crack tips in both static and dynamic fatigue conditions. Cyclic frequency significantly influenced fatigue endurance of fiberglass composites because of the time (testing speed) and temperature (resulting from hysteresis heating) dependent behavior of fiberglass reinforced polymers. Dissert. Abstr.

N79-16075*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF GRAPHITE FIBER STABILITY ON THE PROPERTIES OF PMR POLYIMIDE COMPOSITES
Peter Delvigs, William B. Alston (Army Aviation Res. and Develop. Command, Cleveland, Ohio), and Raymond D. Vannucci 1979 18 p refs To be presented at the 24th Natl. SAMPE Symp., San Francisco, 8-10 May 1979
(NASA-TM-79062; E-9877; AVRADCOM-TR-78-62) Avail: NTIS HC A02/MF A01 CSCL 11D

The effect of the stability of graphite fibers on composite properties after exposure in air at 600 F was investigated. Composites were fabricated from PMR-15 and PMR-2 monomer solutions, using HTS-2 and Celion 6000 graphite fibers as the reinforcement. The effect of long-term exposure in air at 600 F on composite weight loss and mechanical properties was determined. These composites exhibited a significantly increased lifetime at that temperature compared to composites fabricated from HTS fiber sold prior to 1975. The effect of the PMR-15 and PMR-II resin compositions on long-term composite performance at 600 F is also discussed. A.R.H.

N79-16076*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME PROPERTIES OF AN ADVANCED BORON FIBER
Donald R. Behrendt 1979 11 p refs Presented at the Meeting of the Am. Ceramic Soc., Merritt Island, Fla., 22-24 Jan. 1979
(NASA-TM-79065; E-9881) Avail: NTIS HC A02/MF A01 CSCL 11D

An advanced coreless boron fiber exhibits tensile strengths which are more than twice that of the normal CVD B/W fibers. The coreless fiber is made by the chemical removal of the tungsten boride core exposed by splitting the as-grown fiber. The easily splittable fiber is made by the chemical vapor deposition of boron on a larger than usual tungsten substrate. It is expected that the ease of splitting is related to residual stresses in these fibers. Measurements of the axial residual stresses in both the normal and the splittable fibers are presented and the results compared. Differences in these stresses are discussed in connection with the ease of splitting in the splittable fibers. A.R.H.

N79-16077*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE DYNAMIC MODULUS AND DAMPING OF ALUMINUM AND TITANIUM MATRIX COMPOSITES
J. A. DiCarlo and J. E. Maisel (Cleveland State Univ.) 1979 37 p refs Presented at the Symp. on Advanced Fibers and Composites for Appl. at Elevated Temp., New Orleans, 18-22 Feb. 1979 sponsored by the Met. Soc. of AIME
(NASA-TM-79080; E-9901) Avail: NTIS HC A03/MF A01 CSCL 11D

Dynamic modulus and damping capacity property data were measured from 20 to over 500 C for unidirectional B/Al (1100), B/Al (6061), B/SiC/Al (6061), Al2O3/Al, SiC/Ti-6Al-4V, and SiC/Ti composites. The measurements were made under vacuum by the forced vibration of composite bars at free-free flexural resonance near 2000 Hz and at amplitudes below 0.000001. Whereas little variation was observed in the dynamic moduli of specimens with approximately the same fiber content (50 percent), the damping of B/Al composites was found at all temperatures to be significantly greater than the damping of the Al2O3/Al and SiC/Ti composites. For those few situations where slight deviations from theory were observed, the dynamic data were examined for information concerning microstructural changes induced by composite fabrication and thermal treatment. The 270 C damping peak observed in B/Al (6061) composites after heat treatment above 460 C appears to be the result of a change in the 6061 aluminum alloy microstructure induced by interaction with the boron fibers. The growth characteristics of the damping peak suggest its possible value for monitoring fiber strength degration caused by excess thermal treatment during B/Al (6061) fabrication and use. S.E.S.

N79-16078# Defence Research Information Centre, Orpington (England).
THE EFFECT OF HUMIDITY ON THE TECHNICAL PROPERTIES OF PROCESSING POLYCARBONATE
Bela Pukanszky, Jr. Aug. 1978 10 p refs Transl. into ENGLISH from Muanyag es Gumi (Hungary), v. 12, no. 8, 1975 p 273-275
(DRIC-Trans-5070; BR45891) Avail: NTIS HC A02/MF A01

Difficulties in processing polycarbonate resins arise mainly from their high viscosity when molten and from absorption of atmospheric water which causes degradation owing to the formation of carbon dioxide. Experiments are reported on extruding polycarbonate (Lexan 141) exposed for various periods, and at varying extrusion temperatures. It is concluded that at low temperatures the presence of water has a lubricating effect which counters mechanical imperfections of the dry material. With increasing temperature, the mechanical properties of the dry material improve but degradation effects increase. Optimum processing temperatures are concluded to be in the range 290 - 300 C. Author

N79-16079# Royal Aircraft Establishment, Farnborough (England).
THE INFLUENCE OF MEAN STRESS ON THE FATIGUE LIFE OF CARBON FIBRE REINFORCED PLASTICS WITH FIBRE ORIENTATIONS OF + OR - 45 DEG
F. S. Rhodes and J. B. Sturgeon Dec. 1977 21 p refs
(RAE-TR-77187; BR62466) Avail: NTIS HC A02/MF A01

Tensile fatigue tests were performed to assess the effect of changes in mean load on the fatigue behaviour of + or - 45 deg orientations of carbon fiber reinforced plastics. The results were plotted as a master diagram from which it is clear that it is the value of mean and cyclic stresses and not simply the value of the peak stresses which determines fatigue life. L.S.

N79-16080# Royal Aircraft Establishment, Farnborough (England).
THE FATIGUE BEHAVIOUR OF A CARBON FIBRE COMPOSITE WITH LAMINATE CONSTRUCTIONS OF 0 DEG, 0 + OR - 45 DEG
J. B. Sturgeon, F. S. Rhodes, and B. B. Moore Mar. 1978 53 p refs
(RAE-TR-78031; BR63439) Avail: NTIS HC A04/MF A01

Fatigue tests were made on plain specimens of 0 deg, 0 + or - 45 deg and 90 + or - 45 deg orientations of carbon fibre composite. The effect of holes and preconditioning by thermal aging and humidity were studied with 0 + or - 45 deg and 90 + or - 45 deg laminates. S-N curves were obtained from all these tests and some fractured specimens were photographed. The results provide further confirmation that 0 + or - 45 deg CFC is notch sensitive to monotonic loadings but not to fatigue conditions. Prolonged aging at 40 C and humidity exposure at 40 C and 95% RH had no significant effect on fatigue endurance. Author

N79-16081# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF SALT AND SEA-WATER CONTAMINATION ON THE MECHANICAL PROPERTIES OF CORD AND WEBBING
J. E. Swallow and R. B. Gilmore Apr. 1978 32 p refs
(RAE-TR-78043; BR63952) Avail: NTIS HC A03/MF A01

The effects of immersing a braided nylon cord, a flax webbing and a nylon webbing in salt solutions of various concentrations and in sea water have been investigated. Increases in mass per unit length were related to salt concentration and the calculated unoccupied space within the structures. No reduction in strength could be attributed to sodium chloride crystals. Reductions in the strength of nylon webbing occurred after immersion in sea water, consistent with the increased local relative humidity due to the deliquescing substances present in sea water. Washing did not remove all the contaminant from webbing. The additional loss in strength due to immersion in sea water could be of concern in parachutes near the end of their service life. Author

N79-16082# Royal Aircraft Establishment, Farnborough (England). Structure Dept.
STRENGTH AND ELASTIC RESPONSE OF SYMMETRIC ANGLE-PLY CARBON FIBRE REINFORCED PLASTICS
M. B. Snell London Aeron. Res. Council 1978 55 p refs Supersedes RAE-TR-76091; ARC-37230
(ARC-R/M-3816; BR63388; RAE-TR-76091; ARC-37230) Avail: NTIS HC A04/MF A01; HMSO £ 5; PHI

Comparisons between experimentally determined strengths and the theoretical predictions using four simple failure criteria are presented for symmetric angle-ply carbon fibre reinforced plastic laminates under tensile and compressive loads. The effects on non-linearity and failing strain are considered, and a correlation is given between the non-linear behaviour of unidirectional material subjected to shear and the non-linear elastic response of balanced angle-ply test specimens under tension. Author

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N79-16083 Florida Univ., Gainesville.
ROOM TEMPERATURE PHOSPHORESCENCE OF SEVERAL PHARMACEUTICAL PREPARATIONS AND POLYNUCLEAR AROMATIC HYDROCARBONS Ph.D. Thesis
Esther Almira Bower 1978 186 p
Avail: Univ. Microfilms Order No. 7900036

A more extensive list of compounds which can be detected by the use of the room temperature phosphorimetric method is reported. It is shown that room temperature phosphorescence (RTP) can be induced from nonionic compounds, such as polynuclear aromatic hydrocarbons, if a heavy atom perturber is added. Ions such as Ag(+) and Tl(+) are shown to be very efficient at enhancing phosphorescence signals for nonionic compounds, whereas NaI was found to be more effective for ionic compounds. The addition of sodium acetate was found to lead to increased phosphorescence signals. Selectivity is shown among several pharmaceutical compounds but the reason for this is not yet known. An analog switch phosphoroscope (ASP) was constructed. A continuous sampling system for RTP using the ASP was also constructed. Dissert. Abstr.

N79-16084 Pennsylvania Univ., Philadelphia.
NUCLEAR SPIN-LATTICE RELAXATION IN ORTHOPARA MIXTURES OF SOLID DEUTERIUM BELOW THE ORIENTATIONAL ORDERING TRANSITION T LAMBDA Ph.D. Thesis
Myron George Semack 1978 260 p
Avail: Univ. Microfilms Order No. 7824755

Some of the features of the rotational excitation (libron) spectrum of the ordered phase of solid-D2 as a function of ortho-para composition via nuclear-spin lattice relaxation studies were examined. Using an NMR solid-echo technique, spin-lattice relaxation measurements were carried out for a number of ortho-para mixtures between 0.5K and the order-disorder transition temperature. Saturation of the broad cubic phase adsorption line by a multipulse comb of closely spaced pulses at the Larmor frequency (8.0MHz) was followed by a two pulse 'solid-echo' sequence. A single-particle theoretical model for the $l=1$ component of the cubic-D2 solid-echo profile in the case where non-rigid rotation was produced by both pulses of the echo creation sequence was developed to account for selective attenuation of interrogated $l=1$ echo signal brought about by limitations in the bandwidth of the experimental 90 deg Rf pulses. Dissert. Abstr.

N79-16085 State Univ. of New York at Stony Brook.
A CLASSICAL MODEL FOR GAS/SURFACE COLLISIONS Ph.D. Thesis
Lee E. Myers 1978 160 p
Avail: Univ. Microfilms Order No. 7824693

The complex physical situation involved in the binary phase interaction between a gas and solid surface can be qualitatively investigated by use of simple models and classical mechanics. Several such models were developed and utilized. Both atomic and diatomic gases are considered where the atomic species were modeled as point masses and the diatoms were represented as rigid rotors. The investigated surface models include: (1) a single, one dimensional, uncoupled, harmonic oscillator (Einstein model), (2) a single, one dimensional, noisy, damped oscillator (Brownian model), and (3) a single, one dimensional, harmonic oscillator coupled to a single, one dimensional, noisy, damped oscillator (Langevin model). Morse type interaction potentials with parameters semi-empirically chosen are used to represent the physical interaction between the gas and solid surface.
Dissert. Abstr.

N79-16086 Texas Univ. at Austin.
ELECTROGENERATED CHEMILUMINESCENCE: EXCITED STATE PRODUCTION AT METAL AND SEMICONDUCTOR ELECTRODES Ph.D. Thesis
Joseph David Luttmer 1978 222 p
Avail: Univ. Microfilms Order No. 7900599

Electrogenerated chemiluminescence (ECL) arising from direct electron transfer from semiconductor electrodes to solution species was examined. The reduction of the oxidized forms of several luminescent species on several n-type semiconductor electrodes (CdS, ZnO, TiO2, SiC, GaP) was investigated. Only for reduction of rubrene radical cation on n-ZnO and n-CdS was unequivocal evidence found for production of an excited state (triplet) by direct heterogeneous electron transfer at potentials where homogeneous redox processes producing excited states were not possible. Photosensitized oxidations or reductions at p- and n-type GaAs and InP electrodes of aromatic species in aprotic solvents leading to ECL is described. Several sources contributing to detection of emission at wavelengths beyond 620 nm are discussed. Dissert. Abstr.

N79-16087 Rhode Island Univ., Kingston.
POSITIVE IDENTIFICATION OF HIGH PRESSURE LIQUID CHROMATOGRAPHIC PEAKS UTILIZING MULTIPLE WAVELENGTH DETECTION TECHNIQUE Ph.D. Thesis
Ante M. Krstulovic 1978 204 p
Avail: Univ. Microfilms Order No. 7820818

The use of a variable wavelength micro UV detector is illustrated in the detection and identification of liquid chromatographic peaks in two studies: the determination of atmospheric polynuclear aromatic hydrocarbons; and investigation of free nucleoside and base pools in blood from normal subjects and patients with various diseases (breast cancer, benign fibrocystic changes, gout, congestive heart failure and regional enteritis). By selecting a wavelength close to the absorbance maximum of the compound of interest, it is possible to reduce interferences and enhance sensitivity. Furthermore, the use of absorbance ratios provides a simple, rapid and on-line method for determining the identity of the peaks and their purity, directly as they elute from the column. Dissert. Abstr.

N79-16088 West Virginia Univ., Morgantown.
HETEROGENEOUS KINETICS STUDIES ON PLATINUM AND GRAPHITE USING A VIBRATING ELECTRODE, PART 1. HOMOGENEOUS KINETICS STUDIES USING A PACKED GRAPHITE FLOW-THROUGH ELECTROLYSIS CELL, PART 2 Ph.D. Thesis
William Ruppert Passwaters 1978 131 p
Avail: Univ. Microfilms Order No. 7900890

The application of hydrodynamic voltammetry to the study of heterogeneous electron transfer rate constants on platinum and graphite, and homogeneous rate constants for a chemical step coupled with charge transfer reaction(s) is presented. Turbulent flow forced convection at the vibrating electrode was used to determine the kinetic parameters for the reduction of Ce(4+) and Fe(3+) in 1 M H2SO4 and 0.1 M HCl O4 on platinum. Similar redox systems were found generally to have slower rates on graphite than on platinum. An exception, the electron transfer rate of Ce(4+) did not change significantly when the electrode material was changed from platinum to graphite. The rate constants at wax-impregnated graphite were similar to those reported for carbon paste. Cavitation at the vibrating electrode at linear velocities greater than 18 cm/sec limited the magnitude of mass transfer attainable to 0.005 cm/sec.
Dissert. Abstr.

N79-16089 Houston Univ., Tex.
AUTOMATED DEVELOPMENT OF CONTINUOUS-FLOW METHODS Ph.D. Thesis
Ad Sidney Olansky 1978 334 p
Avail: Univ. Microfilms Order No. 7901190

The cresolphthalein complexone method for serum calcium determination was investigated using the modified AutoAnalyzer 2 under computer control. Simplex optimization of reagent concentrations, produced a method yielding 8.5% greater calcium sensitivity and 15% lower baseline absorbance than the standard method. A stopped-flow method for the kinetic Jaffe determination of creatinine was developed under computer control using the automated continuous-flow system. Simplex optimization was used to find conditions of hydroxide and picrate giving maximum sensitivity to creatinine. A modified central composite experimental design was employed to evaluate creatinine sensitivity and protein, glucose, and acetone interferences as functions of hydroxide and picrate concentrations. Dissert. Abstr.

N79-16090 Kansas Univ., Lawrence.
THE DEVELOPMENT AND APPLICATION OF MICROANALYTICAL TECHNIQUES AND DEVICES Ph.D. Thesis
James Christopher Conti 1978 110 p
Avail: Univ. Microfilms Order No. 7824784

A microelectrode system that can be chronically implanted in the brains of small animals is described. The working electrodes are microcapillaries containing a mixture of graphite powder, mineral oil and an epoxy resin. This microelectrode system, when implanted in rat brain, monitors neuronal activity via elevated levels of electroactive neurotransmitters and/or their metabolites. Pharmacological electrical and behavioral manipulations result in changes in electrochemical signal in several brain regions. Evidence is presented that these signals actually represent the electrochemical detection of catecholamines or serotonin (and possibly other unidentified electroactive components) released from nerve terminals. Dissert. Abstr.

N79-16091 Maryland Univ., College Park.
LIQUID CHROMATOGRAPHY WITH ELECTROCHEMICAL DETECTION FOR THE SPECIATION OF ORGANOMETALS Ph.D. Thesis
William Ambrose MacCrehan, III 1978 155 p
Avail: Univ. Microfilms Order No. 7900918

The development of an instrumental measurement system is described, combining high performance liquid chromatography with electrochemical detection to measure individual organometal species. To evaluate the applicability of this detection system, the electroactivities of over twenty organometal species were investigated by cyclic voltammetry. Organometal compounds of mercury, lead, tin and antimony were found to be reduced at potentials less than -1.0 V (versus Ag/AgCl reference electrode) in a 50 percent methanol solvent. Several working electrode materials for the detection system were evaluated for their cathodic potential range, reproducibility and electrontransfer characteristics. The most suitable material was found to be gold amalgamated with a thick layer of mercury. This electrode gave very reproducible current/voltage curves, a wide potential range, and was easily resurfaced. Dissert. Abstr.

N79-16092 Nebraska Univ. - Lincoln.
THE SYNTHESIS AND ELECTROCHEMISTRY OF MAGNESIUM PORPHYRAZINES Ph.D. Thesis
Richard Vincent Whiteley, Jr. 1978 122 p
Avail: Univ. Microfilms Order No. 7900365

Porphyrazines, more specifically tetrazaporphins, are porphyrin macrocyclic systems with the four pyrrole units bridged with nitrogen atoms. They are prepared from 2,3-disubstituted maleic and fumaric dinitriles. The preparation of these disubstituted maleidinitriles and fumarodinitriles was a problem in porphyrazine syntheses. An efficient procedure for the preparation of 2,3-disubstituted succinodinitriles was developed, and unsuccessful attempts to convert these to their respective maleic or fumaric dinitriles are described. However, maleic and fumaric dinitriles can be prepared from beta-ketonitriles. A new synthetic route to these ketonitriles was discovered. It entailed treating an alpha-cyano acid chloride with a dialkyl-cadmium reagent in benzene. Also the preparation of beta-ketonitriles from alpha-bromoketones was undertaken. Dissert. Abstr.

N79-16093 California Univ., Los Angeles.
MOLECULAR MOTIONS IN LIQUID CHLORINE STUDIED BY RAYLEIGH AND RAMAN SCATTERING Ph.D. Thesis
Hovhannes John Topalian 1978 166 p
Avail: Univ. Microfilms Order No. 7901411

The temperature dependence of the polarized and the depolarized Raman, and the Rayleigh band in liquid chlorine, was studied for the temperature range 180 to 240 K using the 5145 A line of an argon ion laser. From the Raman data the vibrational dephasing times and the reorientational relaxation times were determined. The results were compared to predictions made by the rotational diffusion model using stick or slip boundary conditions for the reorienting molecule. The Rayleigh band was more complex, and no unique fits could be made to the data. This is attributed to collective excitations and collision induced light scattering, which along with reorientations make up the Rayleigh intensity. Dissert. Abstr.

N79-16094 Kansas Univ., Lawrence.
ELECTROANALYTICAL TECHNIQUES: APPLICATIONS TO NEUROCHEMISTRY Ph.D. Thesis
Elaine Rose Strope 1978 118 p
Avail: Univ. Microfilms Order No. 7824829

An in vivo electrochemical system which continuously records the concentration of metabolites of biogenic amines in small animal CSF is described. A small electrode, immersed in lateral ventricle CSF through a guide cannula, measures the amine metabolites by voltammetric oxidation. The detailed results of HVA release following electrical stimulation of the nigrostriatal pathway in rats are presented and compared with previous perfusion data. All the electrochemical results are verified by independent liquid chromatographic (chemical) analysis. Some studies of 5-HIAA release in rabbits following raphe stimulation are also reported. The electrochemical techniques were extended to tissue measurements in awake, free-ranging, chronically implanted animals. Summaries of the results of various electrical stimulation and pharmacological manipulation experiments are included. The second part of this thesis describes the electrochemistry of apomorphine. Dissert. Abstr.

N79-16095 North Carolina Univ. at Chapel Hill.
A STUDY OF SURFACES AND PHENOMENA ASSOCIATED WITH SURFACE ANALYSIS USING ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS, 1. INVESTIGATIONS OF THE PLATINUM ELECTRODE SURFACE, 2 Ph.D. Thesis
Elwood Steven Brandt 1978 331 p
Avail: Univ. Microfilms Order No. 7900441

Damage induced by the X-ray photoelectron analysis of sensitive samples was investigated. With X-rays on, carbon contamination of sample surfaces was found to occur much faster on poorly conducting samples than on metallic conductors. Also

the reduction of selected Pt(IV) compounds including PtO2 is shown to occur through independent thermally and X-ray induced pathways. Photoemission-induced charging of poorly conducting samples was studied, using the technique of externally controlled sample biasing. The induced shift of peaks with applied bias was found to be dependent on the polarity of the applied potential due to the contribution of low-energy secondary electrons. A technique describing charging-correction by allowing both sample and gold substrate to electrically float is described. Applications of the technique are described for samples which have areas in electrical contact with the sample probe and areas insulated from the probe. Dissert. Abstr.

N79-16096 North Carolina Univ. at Chapel Hill.
A MULTINUCLEAR BASED FOURIER TRANSFORM NMR SPECTROMETER: MODEL BG SUPERSPECTROMETER, 1. A PHASE LOCKED MULTINUCLEAR OBSERVE/DECOUPLE MODIFICATION FOR A VARIAN XL-100 NMR SPECTROMETER, 2. SEPARATION OF CONTACT AND DIPOLAR LANTHANIDE INDUCED NUCLEAR MAGNETIC RESONANCE SHIFTS: EVALUATION AND APPLICATION OF SOME STRUCTURE INDEPENDENT METHODS, 3 Ph.D. Thesis
Bennie Warren Good 1978 284 p
Avail: Univ. Microfilms Order No. 7900462

A modular oriented multinuclear FTNMR spectrometer was assembled around a HA-100 magnet/probe system using an in-house constructed microcomputer acquisition system. All the remaining HA-100 continuous wave gear was replaced with commercially available modular components to yield a multinuclear FT system. A multinuclear observe and decouple modification for a Varian XL-100 NMR is presented that incorporates state-of-the-art broadbanded components in addition to a direct drive phase lock with the spectrometer's master oscillator. The system was also designed to be idiot proof by being easy to use and hardwired interlock protective of itself and the NMR probe. Structure and electron spin distribution independent methods for separating dipolar and contact contributions to lanthanide induced NMR chemical shifts were evaluated. Dissert. Abstr.

N79-16097 Iowa State Univ. of Science and Technology, Ames.
EVALUATION OF SOME PROCEDURES RELEVANT TO THE DETERMINATION OF TRACE ELEMENTAL COMPONENTS IN BIOLOGICAL MATERIALS BY DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS Ph.D. Thesis
Donald Louis Berry 1978 226 p
Avail: Univ. Microfilms Order No. 7900170

A system was designed and tested for capsulation, irradiation, and decantation of heat sensitive biological materials. A vessel for the controlled destruction of biological materials was designed and evaluated in conjunction with a sulfuric acid/hydrogen peroxide (90%) ashing medium. Hydrated antimony pentaoxide (HAP) and alumina were evaluated for the removal of radio nuclides of sodium and potassium, respectively, from solutions of irradiated biological materials. The bromide, chloride and acetate forms of the ion exchanger AG2-X8 were investigated with respect to concentrating analyte ionic species and removing interfering radio nuclides. A complete procedure was proposed and evaluated for the analysis of standard bovine liver and blood samples. The system was effective for the determination of As, Cu, Fe, Hg, Mo, Rb, Sb, Se, and Zn without yield determination. Dissert. Abstr.

N79-16098 Michigan Univ., Ann Arbor.
CHARACTERIZATION AND OPTIMIZATION OF A SILICON VIDICON SPECTROMETER THROUGH REAL-TIME MICROPROCESSOR CONTROL Ph.D. Thesis
James Edward Hornshuh 1978 251 p
Avail: Univ. Microfilms Order No. 7900704

The spectrometer incorporates a silicon-target vidicon with a fused-silicon window to extend the usable instrument response into the near ultraviolet region. The spectrometer can monitor a 230 nm window in the range of 250 nm to 1000 nm with 1.0 nm resolution. The real-time signal-to-noise ratio of the system is 3086. Real-time control of the vidicon spectrometer is provided by a general purpose multiprocessor system based upon the Intel 8080A microprocessor. Specific examples of task allocation, efficient use of system resources, and utilization of the inherent bandwidth of available microprocessor static memory are provided. The vidicon spectrometer was applied to three basic types of dual-wavelength spectroscopy; dual-wavelength nonscanning spectroscopy, dual-wavelength scanning spectroscopy, and derivative spectroscopy. Dissert. Abstr.

N79-16099 Cornell Univ., Ithaca, N. Y.
TECHNIQUES AND APPLICATIONS OF COLLISIONAL ACTIVATION MASS SPECTROMETRY Ph.D. Thesis
Frank Matthew Buckhoff 1978 102 p
Avail: Univ. Microfilms Order No. 7902310

Collisional activation (CA) mass spectrometry was used for the study of gas phase ion structures and in the development of a system for the direct analysis of mixtures. CA is a process in which ions of high translational energy collide with neutral gas molecules (such as helium) in a field free region of a mass spectrometer resulting in electronic excitation and subsequent decomposition of those ions. The fragmentation pattern of such excited ions (the CA spectrum) was dependent only on the ion's structure and not on its internal energy. Data were obtained with an Hitachi Perkin-Elmer RMU-7 double focusing mass spectrometer with a reverse geometry configuration. Data collection and reduction were implemented with a dedicated minicomputer permitting multiple scanning, storage of data, and output to multiple peripheral devices. A spectrum reproducibility of ±2% was routinely obtained. Dissert. Abstr.

N79-16100 Nebraska Univ., Lincoln.
AN ELECTROCHEMICAL STUDY OF SEVERAL COBALT SCHIFF BASE MOLECULAR OXYGEN COMPLEXES Ph.D. Thesis
Ronald Francis Hammerschmidt 1978 109 p
Avail: Univ. Microfilms Order No. 7900317

The electrochemical behavior of three cobalt(II) Schiff base complexes (N,N'-ethylenebis (salicylideniminato) cobalt(II), N,N'-o-phenylenebis (salicylideniminato) cobalt(II) and N,N'-ethylenebis (3-methoxy-salicylideninimato) cobalt(II)) and their monomeric oxygen adducts was examined at 0 C in pyridine solutions. The entropy values for the reduction of these complexes indicate that the coordination number does not change during the polarographic experiment. The monomeric oxygen adduct, Co(SB)(py)O2, is reduced in a one-electron reversible reaction. A polarographic method was developed for the determination of the formation constant of the monomeric oxygen adduct. The method consisted of determining, from the polarographic diffusion current for the reduction of the oxygenated complex, the oxygen partial pressure at which half of the complex was oxygenated. Dissert. Abstr.

N79-16101 Rochester Univ., N. Y.
RAMAN SPECTROSCOPIC STUDY OF A PRESSURE-INDUCED FERROELECTRIC TRANSITION IN SODIUM NITRATE Ph.D. Thesis
Thomas Robert Lettieri 1978 142 p
Avail: Univ. Microfilms Order No. 7818273

Laser Raman spectroscopy was used to investigate the soft mode dynamics at a pressure-induced, second-order ferroelectric transition in sodium nitrate, NaNO3. The transition, itself, was found to be well-described by classical theories of ferroelectric transitions. The soft mode could be modeled by an uncoupled damped harmonic oscillator and the static properties followed the predictions of mean field theory. The soft mode, which had a pressure-independent damping frequency, was observed to evolve from underdamped dynamics far from the transition to overdamped dynamics within 1 Kb above the critical pressure. Dissert. Abstr.

N79-16102*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
CATALYSTS FOR ELECTROCHEMICAL GENERATION OF OXYGEN Semi-annual Status Report, 1 Apr. 1978 - 30 Sep. 1978
P. Hagans and E. Yeager 30 Sep. 1978 26 p refs
(Grant NGR-36-027-050)
(NASA-CR-158016; SASR-12) Avail: NTIS HC A03/MF A01 CSCL 07D

Single crystal surfaces of platinum and gold and transition

metal oxides of the spinel type were studied to find more effective catalysts for the electrolytic evolution of oxygen and to understand the mechanism and kinetics for the electrocatalysis in relation to the surface electronic and lattice properties of the catalyst. The single crystal studies involve the use of low energy electron diffraction (LEED) and Auger electron spectroscopy as complementary tools to the electrochemical measurements. Modifications to the transfer system and to the thin-layer electrochemical cell used to facilitate the transfer between the ultrahigh vacuum environment of the electron surface physics equipment and the electrochemical environment with a minimal possibility of changes in the surface structure, are described. The electrosorption underpotential deposition of Pb onto the Au(111), (100) and (110) single crystal surfaces with the thin-layer cell-LEED-Auger system is discussed as well as the synthesis of spinels for oxygen evolution studies. A.R.H.

N79-16103# Chemical Engineering Research Group, Pretoria (South Africa).
MEASUREMENT OF THE THERMAL CONDUCTIVITY OF LIQUIDS
D. G. Rogers May 1978 23 p refs
(CSIR-CENG-243; ISBN-0-7988-1331-8) Avail: NTIS HC A02/MF A01

Liquid phase thermal conductivities were measured by a relative method using a vertical coaxial cylinder cell. With calibration, errors in calculated values were less than 5%. This method is recommended for determining the thermal conductivities of mixtures or new products in the process industry. Instructions for using the cell unit are given. Author

N79-16104*# Arizona Univ., Tucson. Optical Sciences Center.
DESIGN, DEVELOPMENT, TEST, AND EVALUATION OF AN AUTOMATED ANALYTICAL ELECTROPHORESIS APPARATUS Progress Report, 1 Sep. 1977 - 31 Aug. 1978
Peter A. Bartels, Milan Bier, L. Ralph Baker, and Charles Blenman, Jr. 22 Dec. 1978 85 p refs
(Contract NAS8-31948)
(NASA-CR-150909) Avail: NTIS HC A05/MF A01 CSCL 07D

An electrophoresis microscope system was developed for the automatic acquisition, display, storage, and eventual analysis of electrophoretic mobility data from living blood cells. The apparatus and the operation of its major components are reviewed. Equipment and fabrication costs are included. A.R.H.

N79-16105*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.
CHARACTERIZATION OF THE ADSORPTION OF WATER VAPOR AND CHLORINE ON MICROCRYSTALLINE SILICA Final Report
Jean Ann Skiles and James P. Wightman Feb. 1979 158 p refs
(Grant NsG-1389)
(NASA-CR-158100) Avail: NTIS HC A08/MF A01 CSCL 07D

The characterization of water adsorption on silica is necessary to an understanding of how hydrogen chloride interacts with silica. The adsorption as a function of outgas temperatures of silica and as a function of the isotherm temperature was studied. Characterization of the silica structure by infrared analysis, X-ray diffraction and differential scanning calorimetry, surface area determinations, characterization of the sample surface by electron spectroscopy for chemical analysis (ESCA), and determinations of the heat of immersion in water of silica were investigated. The silica with a scanning electron microscope was examined. S.E.S.

N79-16106# Little (Arthur D.), Inc., Cambridge, Mass.
SENSITIZED FLUORESCENCE FOR THE DETECTION OF POLYCYCLIC AROMATIC HYDROCARBONS Final Task Report, Jul. 1976 - Aug. 1978
E. M. Smith and P. L. Levins Sep. 1978 33 p
(Contract EPA-68-02-2150)
(PB-287181/2; EPA-600/7-78-182) Avail: NTIS HC A03/MF A01 CSCL 07D

A fluorescent spot test was devised for polycyclic aromatic hydrocarbons (PAH), based on the sensitization of the inherent fluorescence of such compounds. On filter paper, 10 pg of PAH in a spot of 0.25 cm diameter can generally be visualized when treated with naphthalene. In the case of benzo(a)pyrene, 1 pg was detected. This method is specific for PAH with minimum interference from other compounds and may be used to estimate the general level (factors of 10) of PAH in samples to aid in decisions for further more specific analyses. GRA

N79-16107# Midwest Research Inst., Kansas City, Mo.
AFFINITY CROSS-LINKING AGENTS FOR ENZYME STABILIZATION AND IMMOBILIZATION Final Report, 15 Aug. 1974 - 31 Jan. 1978
P. E. Guire May 1978 50 p
(Grant NSF AER-74-08152)
(PB-287343/8; MRI-RA-123-B-2; NSF/RA-780127) Avail: NTIS HC A04/MF A01 CSCL 07D

Eighteen stepwise thermophotochemical crosslinking reagents containing the thermally stable photoreactive 4-azido-2-nitrophenyl group were synthesized and their usefulness in the preparation of soluble biochemically active photoreactive protein derivatives was investigated. Success was achieved in the photocoupling of active enzymes to living cells, photoimmobilization of proteins under gentle conditions to polystyrene and numerous other carrier materials in the dry or wet state, development of portable chromogenic enzyme monitored immunoassay systems, enzyme stabilization, and the preparation of photoreactive soluble ferredoxin-hydrogenase complex which remains fully active in hydrogen generation after photolysis with presumed stable crosslinking between co-factor and enzyme. GRA

N79-16108# National Bureau of Standards, Washington, D. C. Analytical Chemistry Div.
CHEMICAL ANALYSIS OF STATIONARY SOURCE PARTICULATE POLLUTANTS BY MICRO-RAMAN SPECTROSCOPY Interim Report, Apr. 1976 - Mar. 1977
Edgar S. Etz, Gregory J. Rosasco, and Kurt F. J. Heinrich Aug. 1978 44 p refs
(PB-286941/0; EPA-600/2-78-193) Avail: NTIS HC A03/MF A01 CSCL 07D

Analytical capability to identify the principal molecular species present in microparticles is demonstrated on the basis of Raman spectra obtained from microparticles of oilfired power plant emissions collected with cascade impaction samplers. Vanadium pentoxide, V_2O_5, was identified as a major component of microparticles present in such samples. The presence of certain other vanadium containing species such as vanadyl, and ortho-vanadate is not indicated. Other Raman spectra show evidence of crystalline sulfate as a species present in major proportions. Many of the spectra obtained from fly ash particles show Raman bands characteristic of polycrystalline graphite. GRA

N79-16109# FRL - An Albany International Co., Dedham, Mass.
LABORATORY STUDIES ON ADVANCED COMPOSITE H F MODULES FOR SEAWATER REVERSE OSMOSIS Final Report
Myron J. Coplan, Robert B. Davis, John H. Beale, Anthony E. Allegrezza, Jr., and George Lopatin 1978 124 p
(Contract DI-14-34-0001-7508)
(PB-287990/6; W79-00300; OWRT-S-0089(7508)(1); OWRT-S-78-14) Avail: NTIS HC A06/MF A01 CSCL 07D

Development of a reverse osmosis hollow fiber composite membrane targeted for single-pass sea water desalination is described. This membrane is comprised of a furan-based rejecting barrier deposited on and near the surface of a microporous polysulfone hollow fiber. Porous polysulfone fiber substrate is prepared by a regulated dry jet/wet spinning process. The rejection barrier is a cross-linked furan resin formed in situ. It is negatively charged due to the existence of numerous sulfonate groups bound to the resin during polymerization, a condition expected to impact fouling resistance. The mechanics of winding and the resulting cross-wound configuration is designed to minimize channeling and concentration polarization effects. GRA

N79-16110# Collaborative Research, Inc., Waltham, Mass.
CHEMICAL SYNTHESIS AND BIOLOGICAL APPLICATIONS

OF NUCLEIC ACIDS TO NITROGEN FIXATION Semiannual Progress Report, 6 Jan. - 15 Jul. 1978
Jul. 1978 18 p refs
(Grant NSF AER-77-10195)
(PB-286968/3; NSF/RA-780165; SAR-2) Avail: NTIS HC A02/MF A01 CSCL 06A

Methods for the chemical synthesis of oligodeoxyribonucleotides and their application to gene transfer studies involving biological nitrogen fixation were studied. The use of the pivaloyl group for the protection of the amino group of guanine is described and compared to the previously used isobutyryl group. The use of the t-butyldimethylsilyl group in the preparation of N-acylated monomers and as a protecting group for the 3' and 5' hydroxyl function is also examined. These techniques were applied to the scaled up synthesis of protected monomers. A description of the use of the methyl group for the protection of the 3'-5' phosphodiester link is presented, as is a discussion of further investigations of a new chain elongation procedure involving the use of phosphites. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-16111 Tulane Univ., New Orleans, La.
OXYGEN-18 LABELING STUDIES IN TRANSITION METAL CARBONYL COMPLEXES Ph.D. Thesis
Joseph Andrew Froelich 1978 135 p
Avail: Univ. Microfilms Order No. 7901490

Oxygen-exchange studies were conducted for a variety of transition metal carbonyl complexes. The exchange process was monitored via infrared spectroscopy aided by restricted force field calculations for incorporation of isotopic oxygen into the complexes. Relative rates of incorporation were observed to be influenced by substitution at the metal center as well as by change of the metal center. Cationic metal carbonyl complexes of manganese and rhenium were noted to react with oxygen-18 labeled water in a stereo-specific manner. Preferential incorporation of isotopic oxygen in these octahedral systems was related to force constant values of specific carbon monoxide ligands. Manganese complexes were found to be more reactive than rhenium complexes within the iso-electronic series. Addition of a nonreactive amine was observed to accelerate the exchange process for some certain systems. Dissert. Abstr.

N79-16112 Florida Univ., Gainesville.
THE GRAIN SIZE DISTRIBUTION OF ALUMINUM Ph.D. Thesis
Burton Roe Patterson 1978 270 p
Avail: Univ. Microfilms Order No. 7900087

The form of the grain size distribution in polycrystalline aluminum was investigated through the examination of individual grains, separated from the aggregate with liquid gallium. The grain volumes, represented by the grain weights, was found to be statistically approximated by the lognormal distribution. The variability of the width of the size distribution was investigated with respect to the amount of deformation prior to recrystallization and grain growth, and with respect to the rate of solidification of cast material. The frequency distributions of the numbers of faces per grain and edges per face were determined through direct observation of grains separated from the deformed and annealed high purity aluminum specimens. The effect of the frequency of 3-edged faces on the rate of grain growth was tested through the comparison of the growth rates of two series of specimens, deformed 25% and 80%, respectively, before annealing. Dissert. Abstr.

N79-16113 Iowa State Univ. of Science and Technology, Ames.
DISPERSED BARRIER HARDENING IN IRRADIATED METALS Ph.D. Thesis
Marvin Sidney Beck 1978 94 p
Avail: Univ. Microfilms Order No. 7900169

A computer simulation of dispersed barrier hardening was developed and applied to irradiated bcc metals, principally vanadium. The barriers were assumed to be radiation-produced defect clusters in the form of circular dislocation loops on [111] planes. Of the two types of intersections of the loops with [110] slip planes, only the inclined loops were considered to be effective barriers, each loop producing, in general, two barrier points (barrier pairs). Random arrays of these barrier pairs were used to simulate the distribution of barriers on the slip plane. On the basis of constant line tension for the slip dislocation, a computer code was developed for determining the critical shear stress required to move the slip dislocation through the array of barrier pairs as a function of assumed barrier strengths. Dissert. Abstr.

N79-16114 Iowa State Univ. of Science and Technology, Ames.
PROBABILISTIC PREDICTION OF THE JOMINY CURVE OF LOW ALLOY STEELS FROM COMPOSITION AND GRAIN SIZE Ph.D. Thesis
Trieu-Ky Ho 1978 202 p
Avail: Univ. Microfilms Order No. 7900185

The effects of alloy element on the hardenability and methods of hardenability prediction of low alloy carbon steel were investigated. Multiplying factors which reflect the hardenability effect of each alloy element and the ratio initial hardness to distance hardness of a Jominy test were expressed respectively as a function of alloy content and critical diameter of the low alloy carbon steel by least square regression analysis. A computer program was developed to predict the mean and standard deviation of the Jominy hardness curve, using random algebra, from chemical composition and grain size of the steel. Results of the prediction were compared with the actual Jominy hardness data of several steels of different composition and grain size. Dissert. Abstr.

N79-16115 Maryland Univ., College Park.
SPUTTERING OF METALS WITH MEDIUM ENERGY (keV RANGE) IONS Ph.D. Thesis
Omer Faruk Goktepe 1978 230 p
Avail: Univ. Microfilms Order No. 7900914

Sputtering in pure metals and mixtures under irradiation by medium energy ions (keV range) has been investigated theoretically. The moments method formulation of the transport theory has been used to investigate the energy and angular distributions of scattered ions and recoil atoms in solids. A computer code has been developed to simulate the detailed interactions involved in the sputtering of mixtures. In this computer model, the Monte Carlo method has been used to follow single particle histories in a semi-infinite solid target with surface and volume impurities. Also, an experimental design of an ion beam sputtering system is included and discussed. Dissert. Abstr.

N79-16116 Cornell Univ., Ithaca, N. Y.
CHLORINE ADSORPTION ON THE LOW INDEX SURFACES OF SILVER: ENERGETICS AND STRUCTURES Ph.D. Thesis
Yung-Yi Tu 1978 110 p
Avail: Univ. Microfilms Order No. 7902373

The near-equilibrium adsorption of chlorine on silver surfaces was studied using Auger electron spectroscopy (AES) and low energy electron diffraction (LEED). Three silver surface orientations were studied, viz., (110), (111), and (100). The heats of adsorption and information on the adlayer atomic structures were obtained. On Ag(110) the adsorbed chlorine concentration was monitored by AES as a function of pressure in the range from approximately 10 to the -9th power Torr to approximately 10 to the -6 power Torr at four different temperatures. On Ag(111) an adsorption isobar was obtained in the temperature range from approximately 100 C to approximately 600 C. Four chlorine adsorption isobars were obtained for Ag(100) in the temperature range from approximately 100 C to approximately 700 C. The isosteric heat of adsorption was found to be approximately constant over the entire coverage range. Dissert. Abstr.

N79-16117 Case Western Reserve Univ., Cleveland, Ohio.
ADHESION AT A BIMETALLIC INTERFACE Ph.D. Thesis
John Ferrante 1978 321 p
Avail: Univ. Microfilms Order No. 7901514

The Hohenberg-Kohn and Kohn-Sham formalisms are used to examine adhesive binding (binding energy as a function of separation) between combinations of simple metals in contact. The metals examined are A1 (111), Zn (0001), Mg (0001), and Na (110). The adhesion of dissimilar metal contacts of A1, Zn,

Mg are examined using a simple overlap model with the Hohenberg-Kohn formalism along with Smith's parameterized density. The adhesion of similar metal contacts between Al, Zn, Mg, and Na are examined completely self-consistently in an entirely ab initio calculation using the Kohn-Sham formalism. Crystallinity is included. The adhesive binding energy was determined both in the local-density approximation and including gradient corrections to the exchange and correlation energy. Binding was found in all cases. Dissert. Abstr.

N79-16118 Cornell Univ., Ithaca, N. Y.
AN ATOM PROBE FIELD ION MICROSCOPE STUDY OF THE RANGE AND DIFFUSIVITY OF HELIUM IN TUNGSTEN Ph.D. Thesis
Alfred Wagner 1978 273 p
Avail: Univ. Microfilms Order No. 7902377

A time-of-flight (TOF) atom-probe field-ion microscope (FIM) specifically designed for the study of defects in metals is described. This atom probe features (1) a variable-magnification internal image-intensification system based on a channel electron multiplier array for viewing the FIM image; (2) a liquid-helium-cooled goniometer stage which allows the specimen to be maintained at a temperature anywhere in the range of 13 to 450K; (3) a low-energy (< 3 KeV) gas ion gun for in-situ irradiations; (4) an ultra high vacuum chamber to minimize specimen contamination; (5) a high vacuum specimen exchange device; (6) a Chevron ion detector; and (7) and eight channel digital timer with + or - 10 nsec resolution for measuring the TOF's of the pulsed field evaporated ions. The entire process of applying the evaporation pulse to the specimen, measuring the dc and pulse voltages and analysing the TOF data is controlled by a Nova 1220 computer. Dissert. Abstr.

N79-16119 Cornell Univ., Ithaca, N. Y.
ON THE MEASUREMENT OF GRAIN BOUNDARY DIFFUSION AT LOW TEMPERATURES Ph.D. Thesis
James Cheng-Min Hwang 1978 137 p
Avail: Univ. Microfilms Order No. 7902334

The low temperature diffusion of silver along grain boundaries in gold in a specimen consisting of a polycrystalline gold thin film on which a silver layer is initially deposited on one surface (i.e., the entrance surface) was measured using Auger electron spectroscopy. A silver evaporation source and a sample heating stage were incorporated inside the spectrometer so that diffusion anneals could be carried out under well-controlled conditions. The specimens were suspended on special microscope grids so that structural examination could be carried out before and after diffusion. The diffusion temperatures ranged from 270 C to 30 C. By analyzing the Auger peaks at different energies, it was determined that the diffusing silver eventually built up a uniform layer on the exit surface about two monolayers thick. Dissert. Abstr.

N79-16120 Florida Univ., Gainesville.
THE ROLE OF NICKEL SURFACE CURVATURE IN THE HIGH-TEMPERATURE OXIDATION OF NICKEL 270 Ph.D. Thesis
Howard John Healey, Jr. 1978 169 p
Avail: Univ. Microfilms Order No. 7900059

High-temperature oxidation of Nickel 270 (nominally 99,99 + percent nickel) results in the formation of a bi-layered NiO scale composed of an outer layer of columnar grains and an inner layer of equiaxed grains. Measurement of the total scale thickness formed at 1000 C on cylindrical surfaces of nickel (wires for convex surfaces, drilled holes for concave surfaces) that scale thickness is proportional to the surface curvature (i.e., reciprocal of the cylindrical radius). Quantitative measurement of the grain size in both layers of the scale confirmed that the mean grain intercept always increases in proportion to the scale thickness, and that the NiO grain size is larger upon hole specimens than upon wire specimens. The initial grain size, which is presumed to depend upon the nucleation of NiO on the original metal surface, was the same on all convex surfaces, but varied from one concave surface to another. A two-stage model of the high-temperature oxidation of nickel is proposed. Dissert. Abstr.

N79-16121 Cornell Univ., Ithaca, N. Y.
HYDROGEN ATTACK OF SAE 1020 STEEL Ph.D. Thesis
Hsiuan-Ming Simon Shih 1978 205 p
Avail: Univ. Microfilms Order No. 7902205

The basic mechanism of hydrogen attack of SAE 1020 steel was studied through a combined effort of the experimental and theoretical investigations. Studies of the kinetic measurement, optical metallography, and scanning electron microscopy showed that prior cold work increased the population of damage nucleation sites by debonding the matrix-inclusion interface, breaking up large inclusion, fracturing cementities in pearlite zones, and producing high density of microcavities on grain boundaries due to dislocation pile-ups. Macroscopically observable fissures formed from coalescence of methane bubbles. The formation of these fissures was highly inhomogeneous, indicating their time-dependent nucleation and growth. Subgrain formation in the vicinity of fissures indicated a creep-controlled process of fissure or cavity growth. Dissert. Abstr.

N79-16122 Rensselaer Polytechnic Inst., Troy, N. Y.
THE INFLUENCE OF COHERENCY STRAINS ON THE LOW TEMPERATURE MECHANICAL BEHAVIOR OF Ni-15 Cr-Al-Ti-Mo ALLOYS Ph.D. Thesis
Robert Frederick Miller 1978 154 p
Avail: Univ. Microfilms Order No. 7900232

The relative effects of both strengthening mechanisms on the room temperature tensile behavior and aged hardness of Ni-15 Cr-Al-Ti-Mo alloys were studied. The effect of increasing weight fractions of gamma prime on mechanical behavior is also investigated. Mechanical test data were taken on alloys in the solutionized condition and also following peak aging at 760 C. Transmission electron microscopy was used to characterize the microstructure and deformation structure of peak aged alloys. From the results it is concluded that coherency strains and weight fraction of gamma prime are the dominant factors in the strength of high mismatch gamma-gamma prime alloys. Dissert. Abstr.

N79-16123*# National Aeronautics and Space Administration, Washington, D. C.
THE EFFECT OF SURFACE OXIDE LAYER ON THE RATE OF HYDROGEN EMISSION FROM ALUMINUM AND ITS ALLOYS IN A HIGH VACUUM
V. I. Makarova and A. A. Zyabrev Jan. 1979 9 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Mashinostr. (Moscow), vol. 10, 1971 p 131-134 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75361) Avail: NTIS HC A02/MF A01 CSCL 11F

The influence of surface oxide layers on the kinetics of hydrogen emission at the high vacuum of 10 to the minus 8th power torr was investigated at temperatures from 20 to 450 C using samples of pure AB00 aluminum and the cast alloy AMg. Cast and deformed samples of AMts alloy were used to study the effect of oxide film thickness on the rate of hydrogen emission. Thermodynamic calculations of the reactions of the generation and dissociation of aluminum oxide show that degasification at elevated temperatures (up to 600 C) and high vacuum will not reduct the thickness of artificially-generated surface oxide layers on aluminum and its alloys. A.R.H.

N79-16124*# National Aeronautics and Space Administration, Washington, D. C.
THE HYDROGENATION OF METALS UPON INTERACTION WITH WATER
L. A. Andreyev, B. G. Gelman, A. A. Zhukhovitskiy, and Ye. Ye. Polosina Jan. 1979 9 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii Chernaya Met. (USSR), vol. 1, 1972 p 18-21 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Moscow Inst. of Steel and Alloys (Contract NASw-3199)
(NASA-TM-75362) Avail: NTIS HC A02/MF A01 CSCL 11F

Hydrogen evolution at 600 deg and 5 x 10 to the 7th power - 10 to the 6th power torr from AV000 Al samples, which were pickled in 10 percent NaOH, is discussed. An H evolution kinetic equation is derived for samples of equal vol. and different surfaces (5 and 20 sq cm). The values of the H evolution coefficient K indicated an agreement with considered H diffusion mechanism through an oxide layer. The activation energy for the H evolution process, obtained from the K-temp. relation, was 13,000 2000 cal/g-atom. Author

N79-16125# European Space Research and Technology Center, Noordwijk (Netherlands).
EXAMINATION OF NEW TYPES OF RAYCHEM SOLDER SLEEVES
B. D. Dunn and D. S. Collins Paris ESA Sep. 1978 26 p (ESA-STM-210) Avail: NTIS HC A03/MF A01

Samples of Raychem solder sleeves were evaluated. Sleeves containing flux-cored solder-wire preforms are unsuitable for space use, owing to outgassing problems. Solid-solder (fluxless) preforms resulted in inadequate wetting of silver-plated wire shields. The opacity of the sleeve material hindered visual inspection of all these soldered joints, and various defects that would have resulted in their rejection were only revealed after removal of the sleeves. Alternative wire-splicing methods are recommended. L.S.

N79-16126# Defence Research Information Centre, Orpington (England).
LIQUID PHASE SINTERING, DENSIFICATION AND STRUCTURE FORMATION
Gunter Petzow (Max-Planck-Inst. fuer Metallforsch.) and Winifred J. Huppmann (Max-Planck-Inst. fuer Metallforsch.) May 1978 29 p refs Transl. into ENGLISH from Z. fuer Metallk. (Stuttgart), v. 67, no. 9, 1976 p 579-590
(DRIC-Trans-5165; BR45958) Avail: NTIS HC A03/MF A01

The three most important stages of densification during liquid phase sintering are discussed critically. These stages are particle rearrangement, solution re-precipitation, and skeleton sintering. Particle rearrangement is described as a function of the force which a melt bridge between adjacent particles exerts on those particles. Solution re-precipitation processes are shown to contribute to skrinkage during the second sintering stage. Skeleton sintering occurs with the attainment of full density in the sinter specimen, and can be likened to solid state sintering. Microstructural coarsening during liquid phase sintering is discussed on the basis of ostwald ripening and coalescence. A.R.H.

N79-16127# Royal Aircraft Establishment, Farnborough (England).
STRESS CORROSION TESTING OF AU4SG ALUMINIUM ALLOY IN PLATE FORM
Josephine A. Gray May 1978 24 p refs
(RAE-TR-78054; BR64627) Avail: NTIS HC A02/MF A01

The resistance to stress corrosion cracking in the short transverse direction of the 2014 type plate aluminium alloy AU4SG was assessed when aged to peak strength at either 160 C or 175 C, and when overaged. Stress corrosion tests were done in accelerated and natural environments using constant strain and constant strain rate techniques. All of the tests demonstrated that AU4SG aged to peak strength was very susceptible, stress corrosion cracks occurring in the alloy stressed at less than 30 MPa. Overaging to the extent that a 10% loss in 0.2% proof stress resulted, slightly improved the alloy's resistance. Stretching the alloy after solution treatment accelerated the subsequent aging process. No advantage was detected in the use of 160 C rather than 175 C for the aging treatment. The 2014 type alloy produced to DTD 5020A appeared to be slightly more resistant to stress corrosion cracking than the overaged AU4SG tested.
Author

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-16128 Utah Univ., Salt Lake City.
THE THERMAL DEGRADATION OF NYLON SIX, POLYETHYLENE TEREPHTHALATE AND POLYCARBONATE POLYMERS Ph.D. Thesis
Nobuya Igarashi 1978 305 p
Avail: Univ. Microfilms Order No. 7824685

The polymeric samples were decomposed in both inert and oxidative environments. Low-boiling volatiles resulting from pyrolysis and oxidative degradation were identified and quantitated using a computerized gas chromatograph/mass spectrometer (GC/MS) system. The evolution of carbon monoxide was determined by interfacing a nondispersive infrared spectrometer to the pyrolysis apparatus. The high-boiling volatiles were analyzed using high performance liquid chromatography, elemental analysis and infrared spectroscopy. Solid residues which appeared as char, particulates and polymer fragments were also characterized. Using the combined quantitative data from the analysis of low-boiling volatiles, high-boiling volatiles and solid residues, a material balance was obtained for the three different step-growth polymers during pyrolysis and oxidative degradation. Dissert. Abstr.

N79-16129 Iowa State Univ. of Science and Technology, Ames.
MICROMECHANISM OF WEAR AT POLYMER-METAL SLIDING INTERFACE Ph.D. Thesis
Malay Kumar Kar 1978 126 p
Avail: Univ. Microfilms Order No. 7900189

Sliding was performed between the surfaces of AISA 4340 steel (hardened and ground) and a number of polymethylene, and polycarbonate. The worn surfaces were examined by scanning and transmission electron microscopy, and the temperature at the sliding interface between the polymer pin and a steel disc was measured using iron-constantan thermocouples and a slip ring-brush assembly arrangement. A heat transfer equation was developed to predict the temperature rise. It is concluded that wear mechanism at low sliding speeds for all polymers tested is due to adhesion which results in drawing of the junctions into thin films. At medium speeds lumpy particles are produced. At higher speeds the wear failure is due to thermal softening for all the polymers tested except PTFE. Dissert. Abstr.

N79-16130# Defence Research Information Centre, Orpington (England).
MECHANICAL BREAKDOWN OF POLYMERS DURING PROCESSING
G. F. Schoon, H. A. Lueb et al Apr. 1978 15 p refs Transl. into ENGLISH from Kautschuk U. Gummi Kunststoffe (West Ger.), v. 30, no. 1, 1977 p 11-16
(DRIC-Trans-5241; BR45780) Avail: NTIS HC A02/MF A01

A model for the structure of macromolecules postulates their existence in the form of a more or less convoluted string of beads which under high mechanical strain can break down into individual beads or 'tertiary units'. Experiments confirming this hypothesis are described. Polyisoprene and other synthetic rubbers were subjected to multiple extrusions through a high pressure capillary rheometer, and also to kneading in a Brabender plastograph. Molecular weights measured before and after treatment showed reductions consistent with the bead model.
Author

N79-16131# Defence Research Information Centre, Orpington (England).
ON THE FRICTION POLYMER
M. Toyoguchi May 1978 14 p refs Transl. into ENGLISH from Yukagaku (Tokyo), v. 26, no. 9, 1977 p 511-516
(DRIC-Trans-5243; BR45782) Avail: NTIS HC A02/MF A01

Under conditions of boundary lubrication or thin film lubrication there is enough metal-metal contact to raise the temperature of the lubricant and the metal surfaces through friction heating. When a sufficient temperature is reached continuous chemical reactions can occur, both in the lubricant and between the metal surfaces and the lubricant. Organic and organometallic compounds are formed, including a compound known as the friction polymer. This substance is known to have a low coefficient of friction and is thought to have potential use as a non pollution antiwear compound. The formation of friction polymers has been observed with several different metals and lubricants. The structure and production of the friction polymer are discussed.
Author

N79-16132# Royal Aircraft Establishment, Farnborough (England).
THE WEAR OF PLASTICS MATERIALS IN WATER AND AQUEOUS SOLUTIONS
D. C. Evans Jun. 1978 31 p refs
(RAE-TR-78061; BR64223) Avail: NTIS HC A03/MF A01

An investigation was made of the friction and wear properties of a number of thermoplastic polymers and reinforced thermosetting resins during a sliding in water against a stainless steel counterface. In general, wear rates of the thermoplastics are

similar to those measured during dry slidings, but the detailed behaviour of individual polymers appears to depend on their mechanical properties. In contrast, the wear rates of reinforced thermosets in water depend strongly on the way in which the counterface is modified during sliding, and wear rates may be significantly higher or lower than in dry conditions. Wear rates of some thermoplastic polymers have also been measured in oil-in-water emulsions. The results show that even dilute emulsions (about 1% oil by volume) are effective boundary lubricants, and this effect is attributed to the particular way in which the counterface is modified by the formation of a boundary lubricating film. Author

N79-16133# Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey (England).
GLASS FILLED POLYSTYRENES: PROCESSING VERSUS PROPERTIES
R. W. Richards and D. Sims May 1978 33 p refs
(PERME-TR-6; BR62889) Avail: NTIS HC A03/MF A01

The effects of injection molding on two types of glass filled polystyrene are considered using an instrumented molding machine. Certain machine parameters are shown to be important in determining the properties of specimens cut from long glass polystyrene molded discs but rather less important with short glass polystyrene. The importance of avoiding cut edges on molded samples is confirmed. No obvious correlations are found between molding pressures and mechanical properties but a relationship exists between cavity pressure molding weight and size. J.M.S.

N79-16134# Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey (England).
MECHANICS OF CRACK GROWTH IN EPOXIDE ADHESIVES
R. A. Gledhill and A. J. Kinloch May 1978 24 p refs
(PERME-TR-56; BR62890) Avail: NTIS HC A02/MF A01

The failure of structural adhesive joints is considered that consists of metallic substrates bonded with various simple epoxide adhesives. The different modes of crack growth behavior are discussed and possible controlling mechanisms are considered. G.G.

N79-16529# Joint Publications Research Service, Arlington, Va.
EFFECT OF LOW ATMOSPHERIC PRESSURE ON POLYMER OUTGASING
N. A. Glazkova and V. D. Yablochkin *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 87-89 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 64-65 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-16135 West Virginia Univ., Morgantown.
THERMOELASTIC SOLUTIONS FOR IN-SITU GASIFICATION OF COAL Ph.D. Thesis
Hsin-Fuh Wang 1978 250 p
Avail: Univ. Microfilms Order No. 7900893

Linear thermoelastic analyses of structural models associated with underground coal gasification (UCG) are conducted. Idealized crack and cavity configurations simulating the Longwall Generator concept and linked vertical wells concept of UCG are studied by deriving closed form solutions. The relevance of the proposed models and their general applications are provided. Four different isotropic, homogeneous thermoelastic models with steady-state heat conduction and prescribed constant temperature boundary conditions at the crack or cavity surface are investigated. The results provide fundamental data for the possible interpretation of cavity configurations, roof stability and related information. Research indicates that the thermomechanical responses are important in the consideration of UCG processes. Dissert. Abstr.

N79-16136*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF BROADENED-SPECIFICATION FUELS ON AIRCRAFT ENGINES AND FUEL SYSTEMS
R. A. Rudey 1979 25 p refs To be presented at the 4th Intern. Symp. on Airbreathing Eng., Lake Buen Vista, Fla., 1-6 Apr. 1979; sponsored by AIAA
(NASA-TM-79086; E-9898) Avail: NTIS HC A02/MF A01 CSCL 21D

A wide variety of studies on the potential effects of broadened-specification fuels on future aircraft engines and fuel systems are summarized. The compositions and characteristics of aircraft fuels that may be derived from current and future crude-oil sources are described, and the most critical properties that may effect aircraft engines and fuel systems are identified and discussed. The problems that are most likely to be encountered because of changes in selected fuel properties are explored; and the related effects on engine performance, component durability and maintenance, and aircraft fuel-system performance are examined. The ability of current technology to accept possible future fuel specification changes is assessed and selected technological advances that can reduce the severity of the potential problems are illustrated. A.R.H.

N79-16137# Instituto Nacional de Tecnica Aeroespacial, Esteban Terradas, Torrejon de Ardoz (Spain).
DEVELOPMENT OF A MATHEMATICAL MODEL OF THE THERMAL DECOMPOSITION OF HYDRAZINE IN AN ENGINE
J. R. Sanmartin, E. Fraga, A. Linan, and A. Crespo Paris ESA Mar. 1978 115 p refs
(Contract ESTEC-1764/72-HP)
(ESA-CR(P)-1108) Avail: NTIS HC A06/MF A01

An overall chemical kinetics for the decomposition of hydrazine was found for temperatures near 800 K and 1000 K which can be used in the gas dynamic equations of the engine when the mechanical or residence time of the engine is large compared with the radicals relaxation time. This overall kinetics is used for a steady state analysis using the approximation of a perfectly stirred reactor, for times both shorter and longer than the time for wall temperature to reach a steady condition; the validity of these approximations was studied. An alternative plug flow model in which heat is conducted upstream by solid bars was analyzed. The results are reviewed. Author (ESA)

N79-16138# Princeton Univ., N. J. Guggenheim Labs.
FUNDAMENTAL COMBUSTION STUDIES OF EMULSIFIED FUELS FOR DIESEL APPLICATIONS Final Report, 1 Jul. 1974 - 30 Sep. 1977
F. L. Dryer and I. Glassman Dec. 1977 233 p refs
(Grant NSF AER-76-08210)
(PB-287386/7; NSF/AER-76-08210) Avail: NTIS HC A11/MF A01 CSCL 21B

The combustion characteristics of water-in-fuel emulsions were defined and the relationship of emulsion characteristics to the micro-explosion phenomena were examined. Research encompassed emulsion formation techniques, physical characteristics, emulsion coalescence kinetics (stability), single suspendedend free droplet combustion, spray characterization, and nucleate vaporization (of the internal phase) prediction. Results were used to critically evaluate published practical results, predict favorable applications for emulsion combustion, and guide full scale implementation research and development. GRA

N79-16139# Versar, Inc., Springfield, Va.
ASSESSMENT OF COAL CLEANING TECHNOLOGY Annual Report, Jan. 1977 - Jan. 1978
Lee C. McCandless and Robert B. Shaver Jul. 1978 164 p refs
(Contract EPA-68-02-2199)
(PB-287091/3; EPA-600/7-78-150; AR-1) Avail: NTIS HC A08/MF A01 CSCL 08I

Topics of discussion include: (1) washability characteristics of coal, with emphasis on the correlations of various washability

parameters; (2) current technology on coal comminution and gravity separation processes; (3) eleven major chemical coal cleaning processes; (4) current technology on mechanical and thermal drying and oil agglomeration; (5) slurry sampling techniques; and (6) coal preparation requirements for synthetic fuel conversion processes, in terms of particle size, moisture, ash, sulfur, and heating value. In addition, coal preparation requirements for 6 high-Btu gasification processes, 13 low-Btu gasification processes, and 5 liquefaction processes are summarized. GRA

N79-16140# University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
COOKING WITH OFFSHORE OIL: A HANDBOOK FOR CALIFORNIA LOCAL GOVERNMENT
Martin Chorich Aug. 1978 243 p refs Sponsored in part by US Civil Service Commission
(Grant NOAA-04-7-158-44113)
(PB-288656/2; USCSG-AS-01-78; NOAA-78100601) Avail: NTIS HC A11/MF A01 CSCL 10A

This handbook includes: (1) a brief introduction to the leasing process and outer continental shelf (OCS) development issues; (2) an OCS issues chart, summarizing and bringing together the material presented; (3) dissection of development issues and recommendations for planning recipes; (4) policy options open to local governments; (5) recommendations by policy makers involved in the OCS development process concerning promising courses of action, and (6) the appendices and bibliographic references. The appendices contain the correspondences local governments have used to respond to OCS development. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-16141# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
RESPONSE OF EMBEDDED FOUNDATIONS TO TRAVELLING WAVES
Jose Dominguez and Jose M. Roesset Aug. 1978 31 p refs
(Grant NSF ENV-77-18339)
(PB-287130/9; R78-24; MIT-CE-R78-24) Avail: NTIS HC A03/MF A01 CSCL 13M

The motion of a rigid massless square foundation under various types of seismic waves is studied. Surface foundations are investigated using the boundary element method and a comparison is made with other published results. Embedded foundations subjected to vertically travelling shear waves are studied and the results are compared to circular foundations. Finally the case of embedded foundations under a combination of SV and P waves that will produce a free-field motion compatible with the Newmark-Blume-Kapur spectra is investigated. GRA

N79-16142# Central Electricity Generating Board, London (England).
THE CERL DOMETER: A RADIANT HEAT FLUX AND TUBE METAL TEMPERATURE MEASUREMENT SYSTEM FOR HIGHLY RATED BOILERS
E. W. Northover, inventor 1978 12 p
(TDB-294) Avail: NTIS HC A02/MF A01

The new surface mounted boiler tube radiant flux meter described, suitable for use in fossil fuel fired furnaces at fluxes up to 600 kW/sq m was developed for the measurement of local values of heat flux and related tube metal temperatures in highly rated boilers. The measuring instruments, dometers, were designed to operate reliably in heat fluxes up to at least 600 kW/sq m for 10,000 hrs with an accuracy of + or - 10%. The basic design which utilizes a conventional measuring method, is compatible with the weld fusion attachment techniques required and is uncomplicated to manufacture. Boiler tests show that the requirements were met with a proved operational life in excess of 10,000 firing hours. Author (ESA)

N79-16143# Defence Research Information Centre, Orpington (England).
AN INTRODUCTION TO PROCESS DYNAMICS, CONTROL AND PROTECTION, PART 9: THE DYNAMICS AND CONTROL OF HEAT TRANSFER PROCESSES, PART 2
B. Roffel (Tech. Hogeschool Twente) Jun. 1978 10 p Transl. into ENGLISH from Polytech. Tijdschr. Proces Tech. (Netherlands), v. 33, no. 1, 1978 p 41-44
(DRIC-Trans-5336; BR63947) Avail: NTIS HC A02/MF A01

The dynamic behavior of a water filled condenser, and of a tubular heater is described. The temperature of the cooling water, or of the fluid flowing through the pipes, depends on location. As a result, the energy balances contain not only a differential with respect to time, but also a differential with respect to position, so that partial differential equations result. To analyze the fluid dynamics of the water filled condenser, and of the tubular heater, the pipe circuit is divided into a number of segments, assuming an ideal mixing in each segment. Author

N79-16144# National Technical Information Service, Springfield, Va.
CRYOGENIC REFRIGERATION, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1973 - Oct. 1977
William E. Reed Dec. 1978 236 p
(NTIS/PS-78/1261/3) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Cryogenic cooling of electronic equipment, infrared equipment, infrared equipment, cryogenic storage vessels, magnetohydrodynamic generators, and superconducting magnets, coils, rotating machinery, and transmission lines is reported. Marine refrigeration of liquefied natural gas, cryogenic heat pipes, cryogenic heat transfer, and space applications are studied. Methods investigated include adiabatic demagnetization, electrocaloric effect, Joule-Thompson effect, thermoelectric cooling, and Crayton, Claude, Gifford-McMahon, Sterling, and Vuilleumier cycles. This updated bibliography contains 229 abstracts, none of which are new entries to the previous edition. GRA

N79-16145# National Technical Information Service, Springfield, Va.
CRYOGENIC REFRIGERATION, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Nov. 1978
William E. Reed Nov. 1978 84 p Supersedes NTIS/PS-77/1158; NTIS/PS-76/0871; NTIS/PS-75/826
(NTIS/PS-78/1262/1; NTIS/PS-77/1158; NTIS/PS-76/0871; NTIS/PS-75/826) Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Cryogenic cooling of electronic equipment, infrared equipment, cryogenic storage vessels, magnetohydrodynamic generators, and superconducting magnets, coils, rotating machinery, and transmission lines is reported. Marine refrigeration of liquefied natural gas, cryogenic heat pipes, cryogenic heat transfer, and space applications are studied. Methods investigated include adiabatic demagnetization, electrocaloric effect, Joule-Thomson effect, thermoelectric cooling, and Crayton, Claude, Gifford-McMahon, Sterling, and Vuilleumier cycles. This updated bibliography contains 77 abstracts, all of which are new entries to the previous edition. GRA

N79-16146# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS Final Report
Dec. 1978 108 p refs Sponsored in part by DOE
(Contract HUD-H-2689)
(PB-286898/2; HUD-0000189) Avail: NTIS HC A06/MF A01 CSCL 13A

A baseline of practices used for the evaluation of alternative energy standards and their applicability to the design of new building was established. This was accomplished by estimating the energy consumption of residential and nonresidential buildings already constructed from building design data. GRA

N79-16147# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS: RESIDENTIAL DATA COLLECTION AND ANALYSIS

Jan. 1978 122 p refs Sponsored in part by DOE
(Contract HUD-H-2689)
(PB-286899/0; HUD-0000192) Avail: NTIS
HC A06/MF A01 CSCL 13A

Research findings are presented that summarize estimates of designed energy performance for residential buildings including single-family detached, single-family attached, multifamily low-rise, and mobile homes. Performance statistics represent actual buildings throughout the United States and are the result of processing 4,593 residential collection forms for approximately 175,000 single-family and multifamily low-rise units and 175,000 mobile homes. Energy performance estimates include energy for space heating and cooling but do not encompass energy required for the operation of appliances. GRA

N79-16148# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS: DATA ANALYSIS
Jan. 1978 218 p ref Sponsored in part by DOE
(Contract HUD-H-2689)
(PB-286901/4; HUD-0000193) Avail: NTIS
HC A10/MF A01 CSCL 13A

Features of the analysis method used to measure the designed energy performance of buildings are outlined. Major objectives of the analysis were to estimate the mean and 20th, 50th, and 80th percentiles for annual building energy performance figures in various climatic regions to estimate the energy performance of all buildings selected for inclusion in the sample; and to estimate building energy performance by major component of energy and use. Criteria for the selection of an analysis method were devised, and a computerized technique was selected that calculates hourly zone solar and transmission loads for the year using input design loads. GRA

N79-16149# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS: DATA COLLECTION
Dec. 1978 48 p Sponsored in part by DOE
(Contract HUD-H-2689)
(PB-286902/2; HUD-0000191) Avail: NTIS
HC A03/MF A01 CSCL 13A

Data collection procedures employed in estimating the designed energy performance of a random selection of residential and nonresidential buildings are detailed. Buildings and their designers were identified, and each building in the sample was assigned to a regional team of field representatives who were trained to monitor and assist in the completion of data forms. GRA

N79-16150# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS: SAMPLE DESIGN
30 Jan. 1978 107 p Prepared in cooperation with DOE, Washington, D.C.
(Contract HUD-H-2689)
(PB-286903/0; HUD-0000195) Avail: NTIS
HC A06/MF A01 CSCL 13A

The sample design employed in a 1977 building energy performance survey for the Department of Housing and Urban Development is discussed. A sample of 37 standard metropolitan statistical areas (SMSA's) was selected from all SMSA's with a population over 250,000. The selection was simple random within strata defined by the population size of each SMSA, heating degree days of each SMSA, and cooling hours of each SMA. This sample of SMSA's was used to select a secondstage sample of buildings for 12 building types covered by the survey. The basic design requirement was to provide estimates of the 80th percentile of the distribution of energy per square foot per year in buildings for combinations of the 12 building types of 8 climatic zones. GRA

N79-16151# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
A USERS MANUAL FOR GEMS: A GENERALIZED MANUFACTURING SIMULATOR Progress Report, 1 Dec. 1977 - 1 Jun. 1978
Don T. Phillips, Mike Handwerker, and Pruchya Piumsomboon
1 Jun. 1978 138 p refs
(Grant NSF APR-76-22610)
(PB-287094/7; GEMS-7-78) Avail: NTIS HC A07/MF A01 CSCL 13H

The GEMS simulator currently consists of a small main program and 65 subroutine and function subprograms which interact to execute four phases of simulation; input, control, simulation, and output. The manual is divided into five sections: an overview of the GEMS program's organization and operation; data input variables and structure; examples; and warning and error messages. GRA

N79-16152# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
DYNAMIC STIFFNESS OF RECTANGULAR FOUNDATIONS
Jose Dominguez and Jose M. Roesset Aug. 1978 64 p refs
(Grant NSF ENV-77-18339)
(PB-287131/7; R78-20; MIT-CE-R78-20) Avail: NTIS
HC A04/MF A01 CSCL 13M

The boundary element method is used to determine the dynamic stiffnesses of rectangular foundations resting upon or embedded within an elastic half-space. The effects of mesh size and relaxed versus nonrelaxed boundary conditions are investigated for square surface foundations. The static stiffnesses and the frequency dependent stiffness coefficients are then obtained as a function of the aspect ratio for rectangular foundations. Solutions for embedded foundations are obtained and results showing the effects of the embedment ratio are presented. GRA

N79-16153# General Accounting Office, Washington, D. C. Community and Economic Development Div.
GETTING A BETTER UNDERSTANDING OF THE METRIC SYSTEM: IMPLICATIONS IF ADOPTED BY THE UNITED STATES, EXECUTIVE SUMMARY Report to the Congress.
20 Oct. 1978 90 p
(PB-287217/4; CED-78-128A) Avail: NTIS
HC A05/MF A01 CSCL 05C

Whether the Nation's measurement system should be changed is a question still unresolved. GAO has looked into the subject of metrication--conversion to the metric system of measurement. The Congress, the Administration, the newly formed U.S. Metric Board, and in turn all Americans, are provided with a better understanding of the issues are provided. GRA

N79-16154# Portland Cement Association, Skokie, Ill. Construction Technology Labs.
STRUCTURAL WALLS IN EARTHQUAKE-RESISTANT BUILDINGS. DYNAMIC ANALYSIS OF ISOLATED STRUCTURAL WALLS, REPRESENTATIVE LOADING HISTORY Final Report, 1974 - 1978
Arnaldo T. Derecho, Mohammad Iqbal, Satyendra K. Ghosh, Mark Fintel, and W. Gene Corley Aug. 1978 139 p refs
(Grant NSF ENV-77-15333)
(PB-287323/0; PCA-SER-1589; NSF/RA-780255) Avail: NTIS HC A07/MF A01 CSCL 13M

The maximum forces and deformations are estimated that can reasonably be expected in critical regions of structural walls subjected to strong ground motion. This document deals with the qualitative description of 'a representative loading history' which can be used in testing isolated structural wall specimens under slowly reversing loads. One hundred and seventy rotational response histories, representing a broad range of parameter values, are examined. The representative loading history is described in terms of the magnitude of the largest rotational deformation that can reasonably be expected in the hinging region of isolated walls, the total number of cycles of such large-amplitude deformations, and the sequence in which these large-amplitude deformations occur relative to deformations of lesser amplitude. GRA

N79-16155# Integrated Systems, Inc., Rockville, Md.
A STUDY TO REVIEW FIRE PREVENTION AND CONTROL INNOVATIONS AND NEW TECHNOLOGIES DEVELOPED BY FEDERAL AGENCIES SINCE JANUARY 1, 1971, VOLUME 1 Final Report

M. A. Johnson, J. L. Bryan, J. W. Fothergill, and E. B. Douberly
30 Nov. 1977 110 p refs
(Contract NFPCA-6-35590)
(PB-287381/8; Rept-09A78000375) Avail: NTIS
HC A06/MF A01 CSCL 13L

Within the constraints of the contract, an exhaustive effort was performed. A total of 3800 questionaires were mailed to potential contacts within the Federal establishment. Approximately 2900 documents of various forms were abstracted, cataloged, and entered into the computer compatible information base. About 1600 documents were acquired for a collection. GRA

N79-16156# Integrated Systems, Inc., Rockville, Md.
A STUDY TO REVIEW FIRE PREVENTION AND CONTROL INNOVATIONS AND NEW TECHNOLOGIES DEVELOPED BY FEDERAL AGENCIES SINCE JANUARY 1, 1971. VOLUME 2: THESAURUS Final Report
M. A. Johnson, J. L. Bryan, J. W. Fothergill, and E. B. Douberly
30 Nov. 1977 232 p
(Contract NFPCA-6-35590)
(PB-287382/6; Rept-09A78000376) Avail: NTIS
HC A11/MF A01 CSCL 13L

The thesaurus was prepared as a supportive tool for the computer-compatible information base developed for the study of fire prevention and control innovations and new technologies. It was used in the abstracting and citation operation. The thesaurus in combination with the computer-compatible information base and an adequate computerized information system will allow a user to construct keyword search profiles to retrieve all citations of interest in a given field of fire prevention and control. GRA

N79-16157# Integrated Systems, Inc., Rockville, Md.
A STUDY TO REVIEW FIRE PREVENTION AND CONTROL INNOVATIONS AND NEW TECHNOLOGIES DEVELOPED BY FEDERAL AGENCIES SINCE JANUARY 1, 1971. PART 1: COMPENDIUM Final Report
M. A. Johnson, J. L. Bryan, J. W. Fothergill, and E. B. Douberly
30 Nov. 1977 799 p
(Contract NFPCA-6-35590)
(PB-287383/4; Rept-09A78000377) Avail: NTIS
HC A99/MF A01 CSCL 13L

Literature citations are presented with abstracts of approximately 2900 documents that were cataloged and abstracted. The primary goal of the project was to create a resource data base on Federally-sponsored work and to identify high value candidate technological and/or innovative work that could be immediately employed to improve fire safety. Approximately 3800 solicitations for information on such work were mailed over the course of the project in addition to an extensive literature search. GRA

N79-16158# Integrated Systems, Inc., Rockville, Md.
A STUDY TO REVIEW FIRE PREVENTION AND CONTROL INNOVATIONS AND NEW TECHNOLOGIES DEVELOPED BY FEDERAL AGENCIES SINCE JANUARY 1, 1971. PART 2: COMPENDIUM KEY WORD LISTING Final Report
M. A. Johnson, J. W. Fothergill, J. L. Bryan, and E. B. Douberly
30 Nov. 1977 329 p
(Contract NFPCA-6-35590)
(PB-287384/2; Rept-09A78000378) Avail: NTIS
HC A15/MF A01 CSCL 13L

The Key word is listed with cross references to document numbers that appear as citations with abstracts in Part 1; it is essentially a key work index to about 2900 documents resulting from federally sponsored projects. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N79-16159 California Univ., Los Angeles.
SOME ASPECTS OF CLASSICAL GAUGE THEORIES AND FIRST QUANTIZATION SCHEMES Ph.D. Thesis
Victor Aureliano Lugo 1978 69 p
Avail: Univ. Microfilms Order No. 7901378

Electromagnetism is a U(1) gauge theory. If regions of singularity of the field are removed from Minkowski space, a homotopically non-trivial space M is obtained. The integrality of the magnetic or electric charge is shown to be equivalent to the existence of a U(1) vector bundle of fields with connection and a U(1) invariant product over M. In an SO(3) gauge theory, it is shown that a well known singular gauge transformation is not at all singular if the correct coordination of the homotopically non-trivial space is used. A method is detailed whereby the standard quantization based on the Heisenberg group may be generalized to quantizations based on other Lie groups. The case of nilpotent Lie groups is considered for generalization.
Dissert. Abstr.

N79-16160 Virginia Univ., Charlottesville.
THE CONTRIBUTION OF THE AMPLITUDE ENVELOPE OF THE SPEECH SIGNAL TO DISCRIMINATION OF SUPRASEGMENTAL FEATURES OF SENTENCES BY NORMALLY-HEARING SUBJECTS Ph.D. Thesis
Catherine Lucile Farrar 1977 401 p
Avail: Univ. Microfilms Order No. 7901174

An experimental study was conducted to measure the perception of grammatical structure, major constituent boundary and contrastive stress in sentences under three conditions: (1) auditory-alone with the acoustic signal being noise, amplitude-modulated by the speech signal; (2) vision-alone; and (3) audio-visual with speech-modulated noise combined with the visual signal. Three tests were composed, videotaped, and presented in randomized order to fifteen normally-hearing, trained subjects under the three modality conditions. All tests were repeated to determine performance reliability. Subjects were instructed to evaluate the accuracy of each response by assigning confidence ratings on a five-point scale. Dissert. Abstr.

N79-16161 Virginia Univ., Charlottesville.
THE EFFECTS OF STRESSING NORMAL HEARING SUBJECTS JUDGMENT ON THE RESULTS OF THE ABLB, BEKESY, AND TONE DECAY TESTS Ph.D. Thesis
Larry Brooks Gore 1977 159 p
Avail: Univ. Microfilms Order No. 7901135

Changes in subject judgment were studied as a possible cause of the variability often found in the results of the ABLB, Bekesy, and tone decay tests. The experimental design consisted of testing the subjects in a normal clinical condition, under strobe light, and while counting the flashes of the strobe light. Test-retest measures were performed on the same day and following a one week period. Normal hearing was determined by the following test battery: pure tone threshold test, SRT, speech discrimination in quiet and in noise (S/N=0 db). Analysis of the experimental results indicated that the ABLB and tone decay tests were unaffected by the experimental conditions. These tests were found to be reliable between test-retest conditions. The analysis of the Bekesy test data supported the experimental hypothesis.
Dissert. Abstr.

N79-16162 City Univ. of New York.
DELTA MODULATION ENCODING OF VIDEO SIGNALS Ph.D. Thesis
Tsu-Leun Richard Lei 1978 229 p
Avail: Univ. Microfilms Order No. 7900792

Various kinds of delta modulation algorithms were tested by computer simulated systems. The output signal-to-noise ratio and the signal to frame difference ratio are measured. DM step size statistics are studied. Channel error responses are also studied. Delta modulator encoded pictures are shown for subjective comparison. A discussion of entropy encoding of the DM output bit stream is also included. Dissert. Abstr.

N79-16163 New Mexico State Univ., University Park.
PROJECTION THEORY FOR REAL-TIME VISION TRACKING Ph.D. Thesis
Yee Hsun U 1978 133 p
Avail: Univ. Microfilms Order No. 7824625

Computationally efficient techniques are developed for target tracking and identification using two vertical projections and one

horizontal projection. Projection medians are used for target location and orientation computation in a noisy background environment. A translation and target size invariant distance measure is developed to discriminate the targets of interest. To investigate the amount of picture information retained by the extraction of these three projections, it is shown that any convex symmetric (with respect to one axis) object can be exactly reconstructed from the three projections. A brief discussion is presented to describe a prototype real time video tracking system that utilizes the projection techniques developed. Emphasis is placed on the development of a real time tracking algorithm which is realized with a microprogrammable tracker processor. Dissert. Abstr.

N79-16164 British Broadcasting Corp., Kingswood (England). Engineering Div.
MF AND LF RECEPTION: SUSCEPTIBILITY OF DOMESTIC RECEIVERS TO INTERFERENCE
R. V. Harvey Dec. 1978 16 p ref
(BBC-RD-1978/33) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Self-generated interference in domestic lower frequency and medium frequency broadcast receivers is investigated theoretically and the susceptibility of five typical receivers was measured. A systematic analysis of the results was attempted and a procedure was established for assisting planning exercises by assessing the likelihood of interference from particular combinations of frequencies. G.G.

N79-16165 Pennsylvania Univ., Philadelphia.
ADAPTIVE TECHNIQUES FOR CHANNEL UTILIZATION ENHANCEMENT Ph.D. Thesis
Benjamin Olevsky 1978 306 p
Avail: Univ. Microfilms Order No. 7824747

A generalized equation of the optimum value of the complex weighting function of an M-element array is derived and used to formulate an expression of the output signal to noise plus inteference ratio of the receiving system. The behavioral characteristics of the output signal to noise plus interference ratio is assessed as a function of various system parameters; i.e., fractional information bandwidth, the angular separation between the distributed sources, the number of elements in the receiving array, and the element spacing of the receiving array. The principal conclusion is that the distributed source/spatial filtering approach is an effective technique for increasing the transmission rate capability of a fixed bandwidth channel. Using this technique, the enchancement realizable in the transmission rate capability of a fixed bandwidth channel is directly proportional to the number of distributed sources employed. Dissert. Abstr.

N79-16166 Polytechnic Inst. of New York.
ADAPTIVE CHANNEL CAPACITY, DISTRIBUTED MESSAGE-SWITCHING COMMUNICATION NETWORKS Ph.D. Thesis
Kazem Anaraky Sohraby 1978 201 p
Avail: Univ. Microfilms Order No. 7816645

Adaptive branch channel capacity models under variable traffic load are studied. It is assumed that channel capacities of all branches of a distributed message-switching communication network are adjustable over intervals comparable to a few interarrival and or interdeparture times. The adjustment is accomplished by observing the number of messages in finite storage buffers. A combination of time delay of a branch and the utilization cost of channels is considered as the objective function to be minimized. Three different models for branch capacity assignment were studied for control of a single buffer. Dynamic Programming was used to find the best channel capacity control policy for a single buffer. An expression identifying the output rate of a buffer, called affective departure rate, is defined. Dissert. Abstr.

N79-16167 Polytechnic Inst. of New York.
A CONTRIBUTION TO PARTIAL RESPONSE SIGNALING IN DATA TRANSMISSION Ph.D. Thesis
Mohsen Kavehrad 1978 134 p
Avail: Univ. Microfilms Order No. 7816753

The problem of digital data transmission using partial response techniques in the presence of timing jitter, intersymbol interference and white Gaussian noise using a linear equalizer, and zero-memory nonlinearities followed by a linear time-invariant equalizer was considered. The channel was assumed to be bandlimited, corrupted by Gaussian and impulsive noise. To ensure timing jitter immunity, the zero-derivative constraints at sampling times was used as the basis for the receiver design. A design procedure for the suppression of timing jitter in linear partial response systems was developed, and it was shown that a signal corresponding to at least twice the Nyquist bandwidth was necessary to satisfy the timing jitter immunity constraints. It was shown that the overall response may be represented as a filter with a triangular frequency response followed by a tapped delay line. Dissert. Abstr.

N79-16168# National Electrical Engineering Research Inst., Pretoria (South Africa).
THE FADEOGRAM, A SONOGRAM-LIKE DISPLAY OF THE TIME-VARYING FREQUENCY RESPONSE OF HF-SSB RADIO CHANNELS
J. H. J. Filter, B. Arazi, and R. G. W. Thomson Sep. 1977 16 p refs
(CSIR-SR-ELEK-134) Avail: NTIS HC A02/MF A01

A method is given for displaying the time-varying transfer characteristic of an HF SSB radio channel over long durations. The fading characteristics classified are clearly shown by demonstrating in detail the behavior of the channel during one-minute periods. Author

N79-16169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TELECOMMUNICATION SERVICE MARKETS THROUGH THE YEAR 2000 IN RELATION TO MILLIMETER WAVE SATELLITE SYSTEMS
Steven M. Stevenson 1979 13 p Presented at the Intern. Telecommunication Exposition, Dallas, 26 Feb. - 2 Mar. 1979
(NASA-TM-79099) Avail: NTIS HC A02/MF A01 CSCL 17B

NASA is currently conducting a series of millimeter wave satellite system market studies to develop 30/20 GHz satellite system concepts that have commercial potential. Four contractual efforts were undertaken: two parallel and independent system studies and two parallel and independent market studies. The marketing efforts are focused on forecasting the total domestic demand for long haul telecommunications services for the 1980-2000 period. Work completed to date and reported in this paper include projections of: geographical distribution of traffic; traffic volume as a function of urban area size; and user identification and forecasted demand. Author

N79-16170*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Electrical Engineering and Applied Physics.
NEW TECHNIQUES IN TELEVISION TO PROVIDE RESEARCH IN THREE-DIMENSIONAL REAL-TIME OR NEAR REAL-TIME IMAGERY AND REDUCED COST SYSTEMS FOR TELECONFERENCING AND EDUCATIONAL USES, PART 1 Technical Report, 20 Oct. 1975 - 20 Oct. 1978
Yoh-Han Pao, Paul Claspy, John Allen, and Frank Merat 19 Jan. 1979 323 p refs
(Grant NsG-3085)
(NASA-CR-158099) Avail: NTIS HC A14/MF A01 CSCL 17B

The results are presented of a continuing research and development program the objective of which is to develop a reduced bandwidth television system and a technique for television transmission of holograms. The result of the former is a variable frame rate television system, the operation of which was demonstrated for both black-and-white and color signals. This system employs a novel combination of the inexpensive mass storage capacity of a magnetic disc with the reliability of a digital system for time expansion and compression. Also reported are the results of a theoretical analysis and preliminary feasibility experiment of an innovative system for television transmission of holograms using relatively conventional TV equipment along with a phase modulated reference wave for production of the original interference pattern. F.O.S.

N79-16171*# Walla Walla College, College Place, Washington. School of Engineering.
FAR-FIELD RADIATION PATTERNS OF APERTURE

ANTENNAS BY THE WINOGRAD FOURIER TRANSFORM ALGORITHM
Rodney Heisler Oct. 1978 46 p refs
(Contract NAS5-25063)
(NASA-CR-159911) Avail: NTIS HC A03/MF A01 CSCL 20N

A more time-efficient algorithm for computing the discrete Fourier transform, the Winograd Fourier transform (WFT), is described. The WFT algorithm is compared with other transform algorithms. Results indicate that the WFT algorithm in antenna analysis appears to be a very successful application. Significant savings in cpu time will improve the computer turn around time and circumvent the need to resort to weekend runs. S.E.S.

N79-16172# Electromagnetic Compatibility Analysis Center, Annapolis, Md.
AUTOMATED VHF FREQUENCY ASSIGNMENT SYSTEM (FAS) FOR FAA AIR TRAFFIC CONTROL COMMUNICATIONS Final Report
Thomas C. Hensler (ITT Research Inst.) Jul. 1978 17 p refs
(Contracts DOT-FA76WAI-612)
(AD-A061336; ECAC-PR-76-005; FAA-RD-76-14-Suppl-1) Avail: NTIS HC A02/MF A01 CSCL 17/2

A new assignment model that considers cosite and intersite constraints in determining the assignment order and to make program modifications to existing FAS models for the purpose of reducing system response time increasing the efficiency of computer usage is developed. The system is used for assignment gaming including partial and complete assignments, detecting violators, statistical analyses, and plots of service volume. S.E.S.

N79-16173*# Texas Univ. at Austin. Electrical Engineering Research Lab.
CTS ATTENUATION AND CROSS POLARIZATION MEASUREMENTS AT 11.7 GHz Final Report, 18 Oct. 1976 31 Jan. 1978
W. J. Vogel Sep. 1978 23 p
(Contract NAS5-22576)
(NASA-CR-159918) Avail: NTIS HC A02/MF A01 CSCL 20N

The results of data obtained at The University of Texas at Austin during a total of 551 days of righthand circularly polarized transmission at 11.7 GHz from the CTS satellite are presented. Measured were attenuation, cross-polarization and rain rate. Results indicate that ice depolarization can be of significant importance. S.E.S.

N79-16174*# Pacific Missile Test Center, Point Mugu, Calif. Microwave Branch.
RADAR CROSS SECTION MEASUREMENTS OF A SCALE MODEL OF THE SPACE SHUTTLE ORBITER VEHICLE
William T. Yates Mar. 1978 58 p refs
(NASA-Order T-3455-F)
(NASA-CR-158049) Avail: NTIS HC A04/MF A01 CSCL 17I

A series of microwave measurements was conducted to determine the radar cross section of the Space Shuttle Orbiter vehicle at a frequency and at aspect angles applicable to re-entry radar acquisition and tracking. The measurements were performed in a microwave anechoic chamber using a 1/15th scale model and a frequency applicable to C-band tracking radars. The data were digitally recorded and processed to yield statistical descriptions useful for prediction of orbiter re-entry detection and tracking ranges. Author

N79-16175# Secretariat for Nordic Cultural Cooperation, Copenhagen (Denmark).
NORDIC RADIO AND TELEVISION VIA SATELLITE Final Report
1977 109 p
(ISBN-91-7052-333-9) Avail: NTIS HC A06/MF A01

The aims and plans for expansion of radio services to the Nordic countries are outlined. The feasibility of total exchange of radio and television programs by direct broadcasting satellites is examined. Legal, financial and cultural political aspects are noted. ESA

N79-16176# Saab-Scania, Linkoping (Sweden).
A COMPUTER GENERATED IMAGE SYSTEM FOR REAL TIME SIMULATION
B.O. Samuelsson, Tommy Johansson, and Lars Gimstedt 1977 21 p refs Original contains color illustrations
(SAAB-TN-Ae-71) Avail: NTIS HC A02/MF A01

A moderate cost computer driven display system giving color television picture composed of 30 surfaces is described. Each surface is bounded by 4 edges of any slope and position and the color and intensity can be varied within the color television spectrum. The entire picture is updated at 25 Hz and can be used in real-time simulation applications. Author (ESA)

N79-16177# Societe Nationale Industrielle Aerospatiale, Cannes (France).
H-SAT. STUDY ON OPERATIONAL MISSIONS Final Report
Paris ESA 16 Jun. 1978 42 p
(Contract ESTEC-3466/78-NL-SW)
(Rept-251/888-A; ESA-CR(P)-1116) Avail: NTIS HC A03/MF A01

Configurations covering national TVBS (television broadcasting systems) missions were studied in order to demonstrate the growth potential and flexibility of the design of the H-SAT satellite. Four types of TVBS configurations were considered, which represent operational missions for European countries and cover extreme cases of constraints on power and radio frequency equipment. The configurations are based mainly on WARC 77 recommendations. Possible changes in the H-SAT design were identified. Some specific computations used are presented. ESA

N79-16178# Marconi Space and Defence Systems Ltd., Portsmouth (England).
IF BEAM FORMING NETWORK Final Report
J. W. Carter, D. H. Ellis, and D. Hindley Paris ESA Jun. 1978 91 p refs
(Contract ESA-2891)
(BL-2356; ESA-CR(P)-1118) Avail: NTIS HC A05/MF A01

An IFBFN (intermediate frequency beam forming network) was developed for the European Space Agency multibeam array model. The IFBFN consists of four pieces of equipment: an IF processor, which channelizes the broadband input spectrum centered on 30 MHz; a channel-to-beam switching matrix, which controls the assignment of channels to antenna beams; a beam forming matrix, which generates correctly-phased feed signals for each of the 18 antenna elements, from each of the 19 beam inputs; and an upconverter, which separately translates each of the element signals from 30 MHz to L-band, while preserving their phase relationship. The electrical and mechanical design of each equipment is described, and achieved performance parameters are detailed; IFBFN system tests are also discussed. Author (ESA)

N79-16179# European Space Research and Technology Center, Noordwijk (Netherlands).
HYBRID ANALOG COMPUTER TECHNIQUES: THEIR USE IN DESIGNING AND ASSESSING THE PERFORMANCE OF NONLINEAR TRANSMITTERS UNDER MULTICARRIER OPERATION
M. Blanke (Tech. Univ. of Denmark, Lyngby) and T. P. McElhone Paris ESA Apr. 1978 57 p refs
(ESA-STM-205) Avail: NTIS HC A04/MF A01

Hybrid analog computer techniques for designing and assessing the improved multicarrier performance of linearized transmitters using control loops are presented. A computer set-up for simulation of nonlinear, dynamic control loops, and multicarrier signal generation is given in detail. A design for the Marecs L-band power amplifier and its assessment are shown as an example of the accuracy of simulation achievable. Problem areas are discussed. Author

N79-16180# European Space Research and Technology Center, Noordwijk (Netherlands). Data Handling and Signal Processing Div.
PCM TELECOMMAND STANDARD
Paris ESA Apr. 1978 55 p
(ESA-PSS-45-(TTC.A.01)-Issue-1) Avail: NTIS HC A04/MF A01

This standard defines the space/ground interfaces. It establishes and specifies the techniques that will permit ESA

spacecraft to be telecommanded by ESA ground stations with maximum performance and safety, while maintaining a high level of uniformity in the command procedures during mission operations. The level of compatibility with the equivalent NASA-GSFC command standards is also described. G.G.

N79-16181# Eurospace, Paris (France).
NEW DIRECT TELEVISION SERVICES LIKELY TO BE EXPERIMENTED IN EUROPE USING AN H-SAT SATELLITE [SERVICES NOUVEAUX DE TELEVISION DIRECTE SUSCEPTIBLES D'ETRE EXPERIMENTS EN EUROPE AVEC UN SATELLITE H-SAT]
Paris ESA 1978 84 p Partly in FRENCH and partly in ENGLISH
(Contract ESA-3409/77-F-HS(SC))
(ESA-CR(P)-1106) Avail: NTIS HC A05/MF A01

The consequences of the 1977 Geneva conference of the International Telecommunication Union, the possibilities offered by the H-SAT in the perspective of future operational satellites, and the various services (other than conventional television broadcasting) which show most promise for development by existing national organization were published in a four-language brochure and were distributed with a questionnaire to 277 centers in 11 countries. Services which become possible with expanded direct TV transmission include closed circuit television, the transmission of fixed texts, cryptographic television for selective dissemination of information, electronic mail, wide screen television, high fidelity sound transmission, and video data bases. Economic data on the relative costs of satellite transmission and of distribution from large systems is presented. The different technologies under development which will permit direct transmission for these services are described. Transl. by A.R.H.

N79-16182# Plessey Co. Ltd., Towcester (England). Allen Clark Research Center.
MIC CHIP COMPONENT CHARACTERISATION Final Report
R. M. Corlett Paris ESA Jul. 1978 62 p refs
(Contract ESTEC-3225/77-NL-AK)
(CD.6500639; ESA-CR(P)-1126) Avail: NTIS HC A04/MF A01

Characterization techniques used to evaluate gallium arsenide field effect transistors, capacitors in the range 1 to 100 pf, and resistors in the range 10 to 200 o:.m are described. Measurements of the radio frequency parameters of these chip components over the temperature range 5 C to 60 C are given. The components are used in microwave circuits for the satellite 4/6 GHz band and the higher 14/11GHz communication band. A.R.H.

N79-16183# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.
NAVSTAR AIRCRAFT AERIAL SYSTEM. SOME INITIAL CONSIDERATIONS
M. J. Sidford Nov. 1976 23 p refs
(RAE-TM-RAD-NAV-44; BR55426) Avail: NTIS HC A02/MF A01

Aircraft aerial systems for use with the Navstar global positioning system are categorized, and initial design considerations are given for each category from simple omnidirectional aerials to systems with ECCM capabilities. Author

N79-16184# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
COMPUTATION OF THE RADIATION CHARACTERISTIC OF ANTENNAS ON COMPLICATED STRUCTURES IN THE HIGH FREQUENCY CASE. PRINCIPLE OF THE GEOMETRICAL THEORY OF DIFFRACTION
Arno Schrott 26 Jan. 1978 111 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-78-02) Avail: NTIS HC A06/MF A01

The geometrical theory of diffraction is used to determine the radiation characteristic of antennas on complicated structures, such as satellites and aircrafts and the scattering at these structures in the high frequency case. For the solution, the complicated structures were divided into canonical forms which can be analyzed by rigorous asymptotic methods. Beside the ray-optical construction of the high frequency field, the important canonical problem of the diffraction at an edge was treated extensively. The diffraction coefficients for the computation of the diffracted field are presented. The problem of vertex diffraction is discussed. G.G.

N79-16185# Centre National d'Etudes Spatiales, Toulouse (France).
SIMULATION PROGRAM OF NONLINEARITIES APPLIED TO TELECOMMUNICATION SYSTEMS [PROGRAMME DE SIMULATION DE NON-LINEARITIES APPLIQUE AUX SYSTEMES DE TELECOMMUNICATIONS]
Christian Thomas Jan. 1978 39 p refs In FRENCH; ENGLISH summary
(CNES-NT-81) Avail: NTIS HC A03/MF A01

In any satellite communication system, the problems of distorsion created by nonlinear devices or systems must be considered. The subject of this paper is the use of the Fast Fourier Transform (F.F.T.) in the prediction of the intermodulation performance of amplifiers, mixers, filters. A nonlinear memory-less model is chosen to simulate amplitude and phase nonlinearities of the device in the simulation program written in FORTRAN 4. The experimentally observed nonlinearity parameters of a low noise 3.7-4.2 GHz amplifier are related to the gain and phase coefficients of Fourier Service Series. The measured results are compared with those calculated from the simulation in the cases where the input signal is composed of two, three carriers and noise power density G.Y.

N79-16186# National Technical Information Service, Springfield, Va.
RADOME TECHNOLOGY. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978
William E. Reed Dec. 1978 110 p Supersedes NTIS/PS-77/1153; NTIS/PS-76/1015
(NTIS/PS-78/1253/0; NTIS/PS-77/1153; NTIS/PS-76/1015) Avail: NTIS HC $28.00/MF $28.00 CSCL 09E

The use of composite materials, ceramic materials, plastics, dielectrics, and protective coatings for radomes is reported. Research on the design, construction, and fabrication is included. Performance evaluations which cover wave transmission, insertion loss, effect of antenna radiation patterns, rain erosion, and impact resistance are presented. This updated bibliography contains 104 abstacts, 9 of which are new entries to the previous edition. GRA

N79-16187# Institute for Telecommunication Sciences, Boulder, Colo.
CURRENT ACTIVITIES IN SMALL EARTH TERMINAL SATELLITE DOMESTIC TELECOMMUNICATIONS
Paul L. Wells Aug. 1978 134 p refs
(PB-287366/9; NTIA/Report-78/9) Avail: NTIS HC A07/MF A01 CSCL 17B

The present satellites in the domestic satellite service are described and the general technical characteristics are presented. Several uses of earth stations operating in the domestic satellite service are discussed, with particular attention given to the effect the Federal Communications Commission has had on the growth in numbers of earth stations. In conjunction with small earth stations, the impact of the antenna size and pre-amplifier noise temperature on overall earth station cost was studied. Particular attention was given to fixed-satellite and broadcasting-satellite service applications in the frequency bands between 2.5 GHz and 50 GHz. Finally, tariff cost information for domestic satellite and terrestrial telecommunications services is presented. GRA

N79-16188# National Technical Information Service, Springfield, Va.
RADOME TECHNOLOGY, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, Dec. 1976 - Nov. 1978
William E. Reed Dec. 1978 126 p Supersedes NTIS/PS-77/1152; NTIS/PS-76/1014; NTIS/PS-75/847
(NTIS/PS-78/1252/2; NTIS/PS-77/1152; NTIS/PS-76/1014; NTIS/PS-75/847) Avail: NTIS HC $28.00/MF $28.00 CSCL 09E

The use of composite materials, ceramic materials, plastics, and protective coatings for radomes is reported. Research on

the design, construction and manufacturing is included. Performance evaluations which cover wave transmission, insertion loss, effect on antenna radiation patterns, rain erosion, and impact resistance are presented. This updated bibliography contains 118 abstracts, 41 of which are new entries into the previous edition. GRA

N79-16008*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LOW-NOISE RECEIVERS: S-BAND PARAMETRIC UP CONVERTER DEVELOPMENT
S. Petty, D. Neff, and D. Norris *In its* The Deep Space Network 15 Dec. 1978 p 31-47 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 17B

N79-16009*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SIMULTANEOUS DUAL-FREQUENCY, ROUND-TRIP CALIBRATION OF DOPPLER DATA WITH APPLICATION TO RADIO SCIENCE EXPERIMENTS
A. L. Berman *In its* The Deep Space Network 15 Dec. 1978 p 49-54 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 17B

N79-16016*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRACKING ERROR OF 100-m ANTENNA DUE TO WIND GUST
M. Massoudi *In its* The Deep Space Network 15 Dec. 1978 p 94-101 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

N79-16019*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
NEW X-BAND MICROWAVE EQUIPMENT AT THE DSN 64-METER STATIONS
R. Hartop *In its* The Deep Space Network 15 Dec. 1978 p 126-128 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N79-16189 California Univ., Los Angeles.
IMPROVEMENT OF ACOUSTIC-FEEDBACK STABILITY BY TIME-BASE EXPANSION Ph.D. Thesis
Jalal Alisobhani 1978 111 p
Avail: Univ. Microfilms Order No. 7901329

Criteria are developed for a bandwidth-compression technique to effectively improve the stability margin of public address systems. A speech-processing system was developed which incorporates these principles, and a series of tests have been performed both in a room environment and in an acoustic chamber to show how much the stability margin can be improved. The test results have shown that up to 10 dB improvement can be obtained in the stability margin. Dissert. Abstr.

N79-16190 California Univ., Los Angeles.
TOLERANCED CIRCUIT DESIGN: A USER ORIENTED OPTIMIZATION METHOD Ph.D. Thesis
Thomas Steven Radi 1978 146 p
Avail: Univ. Microfilms Order No. 7901391

The effort required of the user of the proposed toleranced circuit design (TCD) algorithm is minimized by specifying (1) the circuit configuration in the SPICE circuit analysis program format; (2) the desired circuit responses; and (3) the elements which are to be considered the m design elements. The TCD algorithm reassigns the nominal values of the design elements so as to maximize the sum of the tolerance of all design elements. In addition to specifying those circuit elements whose nominal points and tolerances may be reassigned, the user may also select any of the circuit elements as fixed tolerance elements. The fixed tolerance elements are non-idealized circuit parameters with a fixed nominal value and fixed tolerance value. The user may wish to specify fixed tolerance parameters for parameters over which he has no control. Dissert. Abstr.

N79-16191 Texas A&M Univ., College Station.
TWO DIMENSIONAL NUMERICAL MODEL FOR THE LATERAL pnp TRANSISTOR Ph.D. Thesis
Agnisarman Namboodiri 1978 97 p
Avail: Univ. Microfilms Order No. 790094

A two dimensional model is detailed that takes heavy doping effects into account by employing doping dependent intrinsic concentration. Terminal characteristics of the injector of an integrated injection logic unit are predicted and the results are verified from measurements made on identical devices. The propagation delay time of the unit is also predicted. By comparing the results with those obtained from a conventional model, it is shown that such a model is not adequate enough to predicting the terminal characteristics of the lateral pnp transistor. Dissert. Abstr.

N79-16192 Texas Univ. at Austin.
TEMPERATURE MEASUREMENT AND CONTROL UTILIZING ORDER-DISORDER PHENOMENA IN MAGNETIC MATERIALS Ph.D. Thesis
William Glen Macbeth 1978 260 p
Avail: Univ. Microfilms Order No. 7900600

The merit of the nonstoichiometric ferrite material as a temperature sensor was investigated. A temperature stabilized oven was constructed using the material as the sensing element. The oven was then used as a research tool to characterize the performance limits of the material. This was accomplished by selecting the optimum operating point of the material and using it as the inductor in an L-C oscillator, giving a temperature dependent output frequency. Two such transducers were used in a dual concentric oven to measure the inner and outer oven temperatures. Measurements of the output frequencies were made available to a microprocessor which performed a digital synthesis of the feedback control function. Digital to analog converters were used to derive a voltage for the inner and outer heaters. A third sensor was included in the inner oven for a statistical performance evaluation. Dissert. Abstr.

N79-16193 Texas A&M Univ., College Station.
A PHENOMENOLOGICAL STUDY OF THE PARAMETRIC INTERRELATIONSHIPS OF THE INVERSE BIPOLAR TRANSISTOR Ph.D. Thesis
Joseph Charles Plunkett 1978 137 p
Avail: Univ. Microfilms Order No. 7901001

A theoretical and experimental study of the interrelationships among several fabrication and design parameters of the bipolar transistor in the inverse mode is presented, with an emphasis toward its improvement for use in integrated injection logic. The effect of recombination in the external base and epitaxial regions on the inverse current gain and related parameters is shown. It is found that the inverse current gain increases with decrease in recombination in the external base region by the introduction of a new double-base process. Improvement of the inverse gain is also shown with a decrease in epitaxial layer thickness until the thickness reaches a point of diminishing returns at about one micrometer width between the space charge regions. Breakdown phenomena related to the external base depth and the epitaxial layer thickness are also discussed. The fabrication process for the double-base diffusion is presented in detail. Dissert. Abstr.

N79-16194 Rensselaer Polytechnic Inst., Troy, N. Y.
CHARACTERISTICS OF A CURRENT-FED INVERTER WITH AUXILIARY COMMUTATION APPLIED THROUGH LOAD NEUTRAL POINT Ph.D. Thesis
Robert Louis Steigerwald 1978 288 p
Avail: Univ. Microfilms Order No. 7900243

A current-fed inverter which is commutated by an auxiliary commutating circuit acting through the load neutral point is investigated. The properties of the inverter and its variations are considered for the case of an ac machine load, although the results are general and can easily be applied to cases where the inverter is interconnected with an ac power system. A voltage

behind subtransient reactance model for either a synchronous machine or an induction machine is shown to result in good prediction of the inverter operating modes. It's shown that if a delayed gating scheme is used for the thyristors, the peak commutating capacitor voltage is actively controlled, and thus, commutation for various inverter conditions is maintained. A scheme of parallel commutation circuits is introduced which allows the value of commutating capacitance to be actively selected as a function of load condition. In this manner, the troublesome case of high-speed, light-load condition can be met, simply by reducing the value of commutating capacitance through thyristor control. Dissert. Abstr.

N79-16195*# Texas Instruments, Inc., Dallas.
CHARGE COUPLED DEVICES Final Technical Report, Jan. 1976 - Jul. 1977
James W. Walker, Larry J. Hornbeck, and Dan P. Stubbs Sep. 1977 283 p
(Contract NAS5-22924)
(NASA-CR-159912; TI-08-77-40) Avail: NTIS HC A13/MF A01 CSCL 09C

The results are presented of a program to design, fabricate, and test CCD arrays suitable for operation in an electron-bombarded mode. These intensified charge coupled devices have potential application to astronomy as photon-counting arrays. The objectives of this program were to deliver arrays of 250 lines of 400 pixels each and some associated electronics. Some arrays were delivered on tube-compatible headers and some were delivered after incorporation in vacuum tubes. Delivery of these devices required considerable improvements to be made in the processing associated with intensified operation. These improvements resulted in a high yield in the thinning process, reproducible results in the accumulation process, elimination of a dark current source in the accumulation process, solution of a number of header related problems, and the identification of a remaining major source of dark current. Two systematic failure modes were identified and protective measures established. The effects of tube processing on the arrays in the delivered ICCDs were determined and are reported along with the characterization data on the arrays. Author

N79-16196# Madrid Univ. (Spain). Dept. of Applied Physics.
DEVELOPMENT OF A COLD CATHODE ELECTRON EMITTER FOR IMAGE TUBES
F. Rueda, S. A. Romero, and L. Robledo Paris ESA 1978 62 p refs
(Contract ESTEC-2208/74-AK)
(ESA-CR(P)-1102) Avail: NTIS HC A04/MF A01

The technology for the production of a Schottky barrier of the Si:Pt type was developed. Diodes with an active region of 0.8 mm diameter etched across thermal silicon oxide were manufactured using photolithographic techniques. These diodes kept their characteristics after being baked by electron bombardment at 400 C in ultrahigh vacuum (UHV) with small leakage even with a cesium layer, due to the protection of the oxide. After cesiation no electron emission was detected in five samples; three samples were tested in UHV of a mercury diffusion pump; and two samples in UHV of ionic-titanium sublimation pump, with similar negative results. The Schottky barriers are less efficient in emission than the p-n junctions. A defective cesiation may appear as the primary cause for these negative results. It was also concluded that platinum is not appropriate for cold cathode Schottky barriers, and silver or palladium are better metals due to their lower work function. Author (ESA)

N79-16197# Laboratoires d'Electronique et de Physique Appliquee, Limeil-Brevannes (France).
EXTENSION OF THE EVALUATION PROGRAM OF HIGH PERFORMANCE IMPATT DIODES TO P(+)N JUNCTION DIODES Final Report [EXTENSION DU PROGRAMME D'EVALUATION DE DIODES IMPATT A HAUT RENDEMENT AUX DIODES A JONCTION P(+)N]
A. Boucher, D. Meignant, M. Ranneau, and B. Touratier Paris ESA Apr. 1978 33 p ref In FRENCH
(Contract ESTEC-2498/75-K)
(LEP-78/256.SME-620-E; ESA-CR(P)-1103) Avail: NTIS HC A03/MF A01

The reliability of IMPATT junction diodes in comparison with that of Schottky barrier diodes was studied. High temperature tests were carried out at 200, 250, and 265 C and the corresponding Arrhenius diagrams were drawn up. Using the results, an activation energy of 2.2 V was calculated. It is shown that an average lifetime of 10 million hours at a junction temperature of 180 C is possible. It is concluded that the P/N junction diodes have a mean time between failure about two orders of magnitude higher that that of Schottky barrier diodes. ESA

N79-16198# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France). Centre de Fiabilite.
STUDY ON FAILURE PHYSICS AND RELIABILITY OF HYPERFREQUENCY TRANSISTORS. VOLUME 1. Final Report [ETUDE DE LA PHYSIQUE DES DEFAILLANCES ET DE LA FIABILITE DES TRANSISTORS HYPERFREQUENCE. VOLUME 1: RAPPORT FINAL]
Paris ESA Oct. 1977 397 p In FRENCH
(Contract ESTEC-2037/73-AK)
(ESA-CR(P)-1099-Vol-1) Avail: NTIS HC A17/MF A01

Technological processes for manufacturing hyperfrequency bipolar low noise, bipolar power, and field effect transistors, and the failures that may occur when applying variations to the manufacturing process, are reviewed. The following procedure was followed: sending out enquiries and interviewing the manufacturers; elaborating on the information obtained; drawing up the relationship between the technological processes and the failure mechanisms; and choosing the components for testing. ESA

N79-16199# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France). Centre de Fiabilite.
STUDY ON FAILURE PHYSICS AND RELIABILITY OF HYPERFREQUENCY TRANSISTORS. VOLUME 2: SUMMARY OF FINAL REPORT AND RECOMMENDATIONS FOR UTILIZATION Final Report [ETUDE DE LA PHYSIQUE DES DEFAILLANCES ET DE LA FIABILITE DES TRANSISTORS HYPERFREQUENCE. VOLUME 2: RESUME DU RAPPORT FINAL ET RECOMMANDATIONS D'EMPLOI]
Paris ESA Oct. 1977 156 p In FRENCH 2 Vol.
(Contract ESTEC-2037/73-AK)
(ESA-CR(P)-1099-Vol-2) Avail: NTIS HC A08/MF A01

Technological processes for manufacturing hyperfrequency bipolar low noise, bipolar power, and field effect transistors and the failures that may occur when applying variations to the manufacturing process are reviewed. The choice, tests, and acceptance procedures for a high performance component (a transistor for a submerged repeater) are presented. The results for low noise and low power bipolar silicon hyperfrequency transistors and for gallium arsenide field effect transistors are presented. ESA

N79-16200# European Space Research and Technology Center, Noordwijk (Netherlands).
ELECTROSTATIC SIMULATION TEST OF THE IMPROVED OUTER ALUMINIZED KAPTON LAYER AS PROPOSED FOR THE OTS VHF SHIELD
J. Bosma Paris ESA Apr. 1978 25 p refs
(ESA-STM-203) Avail: NTIS HC A02/MF A01

Electrostatic discharge testing of the OTS VHF shield assembly indicated that evaporation of relatively large areas of vacuum deposited aluminum occurred on the back of the aluminized Kapton sample as a result of numerous discharges. This could lead to an increased heat input to the VHF shield. The solution proposed to this problem was to raise the thickness of the aluminum layer to 1 mil, that of the Kapton remaining 3 mil. This report describes the tests performed on the two types of aluminized Kapton, the conclusion being that the improvement soúght is indeed achieved. Author

N79-16201# European Space Research and Technology Center, Noordwijk (Netherlands)
EVALUATION OF A CONDUCTIVE ADHESIVE SYSTEM FOR THE GROUNDING OF ALUMINISED KAPTON TAPE
J. Bosma, M. Froggatt, and G. Groumelon Paris ESA Jun. 1978 28 p
(ESA-STM-204) Avail: NTIS HC A03/MF A01

A grounding system is evaluated for aluminized Kapton

thermal-control film. The system utilizes a low-outgassing, electrically conductive, silicone adhesive, which is fast cured by means of a hot probe. G.G.

N79-16202# European Space Research and Technology Center, Noordwijk (Netherlands).
PROBLEMS ENCOUNTERED WITH THE USE OF SEMI-RIGID CO-AXIAL CABLES IN SPACECRAFT ELECTRONICS
P. Fletcher Paris ESA Sep. 1978 21 p refs
(ESA-STM-209) Avail: NTIS HC A02/MF A01

The solder-joint cracking problems observed during the construction of coaxial cable assemblies on various ESA satellites are discussed. The cracking occurred at the connector/coaxial-cable joints and was observed to have various causes and contributing factors. The various modes of cracking are discussed and, in addition, the possiblity of voltage standing-wave ratio deterioration is described. The majority of the problems can be directly related to an unsatisfactory assembly procedure. G.G.

N79-16203# ERA Ltd., Leatherhead (England). R.F. Technology Centre.
STUDIES OF FEEDS AND REFLECTORS FOR HIGH GAIN SPACECRAFT ANTENNAS Final Report
N. A. Adatia, B. Watson, R. Dewey, and A. W. Rudge Paris ESA Feb. 1978 350 p refs
(Contract ESTEC-2742/76-NL-AK(SC))
(ERA-RFTC-220676; ESA-CR(P)-1111) Avail: NTIS HC A15/MF A01

Primary-feed and reflector systems for spacecraft antennas were studied, in the light of electrical specifications formulated by ESA and based upon anticipated requirements for future spacecraft missions. The antennas studied include a dual offset-reflector geometry preferred by ESA and an alternative single offset-reflector configuration. In both cases the antennas are intended to generate either shaped-beam or multiple-beam radiation-patterns with exceptional polarization purity. The electrical performance of these antennas is evaluated and new primary-feed devices which are made necessary by the exacting specifications are considered. Both theoretical and experimental aspects of the work are provided. Conclusions are drawn and recommendations made with regard to further development of preferred antenna configurations. A.R.H.

N79-16204# Centre d'Etudes et de Recherches, Toulouse (France). Departement d'Etudes et de Recherches en Automatique.
DEVELOPMENT AND APPLICATION OF NUMERICAL MODELS FOR THE EVALUATION OF POWER SYSTEMS [DEVELOPEMENT ET APPLICATION DE MODELES NUMERIQUES POUR L'EVALUATION DES SYSTEMES DE PUISSANCE]
A. J. Fossard and M. Clique Paris ESA Jul. 1978 256 p refs language in FRENCH, partly in ENGLISH
(Contract ESTEC-2590/75-AK)
(CERT-12/7121-DERA; ESA-CR(P)-1131) Avail: NTIS HC A12/MF A01

The modeling and control of dc to dc voltage converters is discussed. The use of the current injection method yields low frequency small signal models that are sufficiently precise to evaluate different parasite phenomena. The output authorizes the use of a command to return the variables of the physical state and of the modal control. A generally accurate model of the limit-cycling conductance controller is used to obtain models of a boost cell. The introduction of input and output filters is considered as well as stoppage time. The general problem of compensation is discussed. Transl. by A.R.H.

N79-16205# Defence Research Information Centre, Orpington (England).
STRUCTURE AND PROPERTIES OF 'OHMIC' CONTACTS ON GaSb
K. Vogel and A. Engel May 1978 11 p refs Transl. into ENGLISH from Kristall u. Tech. (East Ger.), v. 8, no. 9, 1973 p 1083-1092
(DRIC-Trans-5176; BR45965) Avail: NTIS HC A02/MF A01

Measurements of the ohmic contact resistances of Ag-, Au-, Ni-, Al-, In-, Sn- and Ag-In contacts are described. These contacts were made by evaporating films on n- and p-GaSb. The stages of this process were investigated according to the crystalline state of the materials. The measurements indicated a considerable influence on contact resistance as a result of surface treatment and structure of the contact metals. Temperature effects were also noticeable. Sn/Ag/Au-contacts on n-GaSb and Ag- and Au-contacts on p-GaSb became ohmic contacts after an alloying process. G.G.

N79-16206# Royal Aircraft Establishment, Farnborough (England). Space Dept.
IMPEDANCE-MATCHING NETWORKS OF THE L TYPE
P. B. Walkley May 1978 38 p refs
(RAE-TR-78049; BR64229) Avail: NTIS HC A03/MF A01

An L-network is an electric network comprising two reactive arms, one in series and one in shunt. Any two impedances can be matched at a single frequency by at least one such network. This report explains relevant theory, sets out design equations, and examines the broadband matching performance of L-networks both algebraically and by means of computer analysis of examples. It is shown that these networks have occasional broadband uses. Treatment is general but findings are expressed in terms of circuits which operate at frequencies in the low gigahertz region. Author

N79-16207# Centre National d'Etudes Spatiales, Toulouse (France).
DESIGN AND ASSEMBLY OF A MICROWAVE FIELD EFFECT AMPLIFIER IN THE 5.9 TO 6.4 GHz BAND [CONCEPTION ET REALISATION D'UN AMPLIFICATEUR A TRANSISTOR A EFFET DE CHAMP DANS LA BANDS 5,9 A 6,4 GHz]
Jean-Luc Sedard Feb. 1978 100 p refs In FRENCH; ENGLISH summary
(CNES-NT-82) Avail: NTIS HC A05/MF A01

The steps involved in the design and assembly of a microwave field effect amplifier are: (1) characterization of the transistor by its parameters; (2) design and assembly of a two stage high gain amplifier; (3) measurement and calculation of transistor noise characteristics; and (4) design and assembly of a low noise amplifier. G.Y.

N79-16208# National Technical Information Service, Springfield, Va.
FREQUENCY SYNTHESIZERS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Oct. 1978
William E. Reed Dec. 1978 188 p Supersedes NTIS/PS-77/1102; NTIS/PS-76/0829; NTIS/PS-75/790
(NTIS/PS-78/1254/8; NTIS/PS-77/1102; NTIS/PS-76/0829; NTIS/PS-75/790) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

Spread spectrum and single sideband communications, navigation, and frequency control are applications on frequency synthesizers reported. Methods and devices used include surface acoustic waves, digital control, number representation schemes, phase shift, cesium beam tubes, and phased locked systems. This updated bibliography contains 180 abstracts, 24 of which are new entries to the previous edition. GRA

N79-16209# National Technical Information Service, Springfield, Va.
FREQUENCY SYNTHESIZERS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978
William E. Reed Dec. 1978 189 p Supersedes NTIS/PS-77/1103
(NTIS/PS-78/1255/5; NTIS/PS-77/1103) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

Communications, radar, music synthesizers, frequency control, biomedical and test equipment, and microwave systems are applications of frequency synthesizers reported. Methods and devices used include surface acoustic waves, phased locked systems, digital control, number representation schemes, and voltage controlled systems. This updated bibliography contains 183 abstracts, 27 of which are new entries to the previous edition. GRA

N79-16018*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PRELIMINARY MODEL FOR HIGH-POWER-WAVEGUIDE ARCING AND ARC PROTECTION
H. C. Yen *In its* The Deep Space Network 15 Dec. 1978 p 118-125 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N79-16210 Texas Univ. at Austin.
ENERGY AND ECONOMIC ANALYSIS OF INDUSTRIAL PROCESS HEAT RECOVERY WITH HEAT PUMPS Ph.D. Thesis
Alfredo Heli Urdanetta-Bohorquez 1978 280 p
Avail: Univ. Microfilms Order No. 7900645

A two-stream process scheme is considered as the basic heat pump heat recovery model around which the energy-economic analysis is developed. An algorithm is implemented to search for the heat pump cycle operational conditions that minimize energy consumption and maximize economic profitability. The measure of energy performance is the ratio of primary energy consumption by the heat pump system to primary energy consumption by the reference (no heat recovery) process configuration. The measure of economic profitability is an internal rate-of-return obtained from an incremental aftertax present worth analysis of the heat pump. Two economic scenarios are modeled to reflect future energy costs: a government regulated energy market and a free energy market option. Two investment strategies are modeled to analyze the incorporation of heat pumps within a process configuration: new design and retrofit. A food processing industry example and a petroleum refinery example are parametrically analyzed. Dissert. Abstr.

N79-16211 Oregon Univ., Eugene.
TRANSITION TO TURBULENCE IN COUETTE FLOW BETWEEN CONCENTRIC CYLINDERS Ph.D. Thesis
Robert William Walden 1978 130 p
Avail: Univ. Microfilms Order No. 7901106

Measurement of fluctuation in local velocity in fluid motion between a rotating inner cylinder and a fixed outer cylinder are reported for rotation rates up to 50 times R sub c, the critical Reynolds number for Taylor instability. The apparatus consists of two pairs of concentric cylinders: one pair with a glass outer cylinder for visual observations; the other with nearly identical dimensions, of gold-plated brass for measurements using an ion technique. The 1mm dia. ion collectors provide a local probe of the radial component of fluid velocity in a narrow boundary at the outer cylinder. The brass outer cylinder has an array of 1500 ion collectors allowing various axial and azimuthal separations between collector pairs to be chosen. Any four collectors may be monitored simultaneously. Radius ratio eta = R sub 1/R sub 2 = 0.875, and data was taken for aspect ratio Gamma (Gamma identical with fluid height/cylinder gap width) ranging from 18 to 80. Dissert. Abstr.

N79-16212 Iowa State Univ. of Science and Technology, Ames.
PREDICTION OF TURBULENT JETS AND PLUMES IN FLOWING AMBIENTS Ph.D. Thesis
Shinh-Sing Hwang 1978 184 p
Avail: Univ. Microfilms Order No. 7900188

A differential approach for the analysis of the behavior of turbulent, axisymmetric buoyant jets and plumes discharged into a crossflowing ambient is presented. The thin shear layer form of the governing partial differential equations for the conservation of mass, momentum and energy, derived in a curvilinear, orthogonal coordinate system is solved numerically by a fully implicit finite-difference technique. A lumped analysis is proposed to simplify the momentum equation in the transverse direction. The same calculation procedure was also applied to coflowing or quiescent ambient cases to verify the turbulence model and computational techniques. Predictions from the analysis show good agreement with experimental data in all these flow categories. A finite-difference solution method was developed and applied to predict three-dimensional, laminar jets discharged from a square or rectangular orifice. A streamwise marching procedure utilizing the pressure correction concept was used. Dissert. Abstr.

N79-16213 Arizona State Univ., Tempe.
THE THERMAL ACCOMMODATION COEFFICIENT OF HELIUM AND ARGON ON AN AMORPHOUS SiO2 SURFACE Ph.D. Thesis
Alan Leroy McFall 1978 145 p
Avail: Univ. Microfilms Order No. 7901717

The surface was processed as an integrated circuit chip and utilized components capable of generating heat and measuring temperature. An automatic external feedback circuit was used to maintain a constant surface temperature at all times. An all metal stainless steel vacuum system with ionization pump and titanium sublimation was used along with a mass-spectrometer type gas analyzer to determine the level of contaminants. The accommodation coefficient of helium on clean SiO2 was found to be 0.198 while that for argon was 0.421. The Debye temperature was computed for elastic constants to be 498 K. Results are presented for the variation of the accommodation coefficient with gas pressure in order to certify that all measurements were taken in the free-molecular flow regime. In addition, data are presented for the accommodation coefficients of helium and argon on a clean tungsten wire. Dissert. Abstr.

N79-16214 Nebraska Univ. - Lincoln.
LATERAL MIGRATION IN A MICROPOLAR FLUID: A MODEL FOR SLURRIES OF FINE AND COARSE PARTICLES IN A NEWTONIAN LIQUID CARRIER Ph.D. Thesis
MaryAnn Helen Fitzwater 1978 230 p
Avail: Univ. Microfilms Order No. 7900310

The flow of a suspension composed of fine and coarse rigid particles in a Newtonian liquid carrier was studied. Both simple shear and plane Poiseuille flow are treated. The motion of the larger particles is treated using the theory of inertia-induced lateral migration. The smaller particles and the carrier are treated together as a micropolar fluid. The translational and rotational velocities of one of the larger particles are found. Dissert. Abstr.

N79-16215 Texas Univ. at Austin.
FLOW WITH SIMULTANEOUS HETEROGENEOUS REACTIONS IN POROUS MEDIA Ph.D. Thesis
Alfred Daniel Hill 1978 156 p
Avail: Univ. Microfilms Order No. 7900575

A theoretical model of the matrix acidization of sandstone by a hydrofluoric-hydrochloric acid mixture was developed. A capillary model of the pore structure was coupled with material balance equations describing the acid and solid species to yield a dynamic description of the acidization process. The model was solved first in linear coordinates so that it could be compared with the results of Berea sandstone core flood experiments which were performed previously. The acidization model was then applied in radial coordinates to generate design curves for a field-scale acidization treatment. The design curves developed in this study relate acid mixture injection rate and cumulative volume requirements to the desired distance of permeability improvement into the sandstone matrix as a function of temperature and rock composition. Dissert. Abstr.

N79-16216 Iowa State Univ. of Science and Technology, Ames.
DROP SEPARATION BY NUMERICAL SOLUTION OF THE NAVIER-STOKES EQUATION Ph.D. Thesis
Dale Alan Fitzgibbons 1978 143 p
Avail: Univ. Microfilms Order No. 7900180

A numerical model of separating drop behavior was constructed and tested by simulation, on a general purpose digital computer, of a hypothetical two-immiscible-phase system. The model used the Marker-and-Cell (MAC) method to solve the unsteady state Navier-Stokes (momentum balance) equation with incompressible flow. Input to the model consisted of fluid parameters (density, viscosity, interfacial tension), initial conditions (interface profile and velocities), and forcing functions. Simulation

results consisted of time varying velocity and pressure fields, and all transformations of the interface profile. The test simulation began with a pendant drop possessing the maximum or critical volume. All fluid elements were initially at rest and all pressures were hydrostatic. The equilibrium was disturbed by application of a gravitation pulse. The profile then deformed as the bulk of the drop accelerated into the surrounding medium.
Dissert. Abstr.

N79-16217 Maryland Univ., College Park.
VENTURI DESIGN PARAMETERS FOR AIR INJECTION INTO A FOAM FRACTIONATION SYSTEM Ph.D. Thesis
Thomas Booker Lawson, III 1978 226 p
Avail: Univ. Microfilms Order No. 7900904

A venturi aspirator device was used to introduce humidified air into a foam fractionation system. The liquid solution consisted of Triton X-100 dissolved in deionized water. Using dimensional analysis and a model system, the effects of four independent variables on separation efficiency were studied. The variables were feed solution flow rate, venturi throat cross sectional area, air hole cross sectional area, and number of air holes and were evaluated in the form of independent Pi terms. The model analysis results were used to develop an equation to predict the separation efficiency of prototype venturi systems. A prototype venturi was then used to evaluate the prediction equation developed in this research. Pressure upstream of the venturi throat section, vacuum in the throat section and pressure drop through the venturi were mathematically related to variations in feed solution flow rate and throat diameter. Dissert. Abstr.

N79-16218 Kansas Univ., Lawrence.
TWO-PHASE AIR-WATER UPWARD ANNULAR FLOW IN A CONVERGING NOZZLE Ph.D. Thesis
William Robert Martindale 1978 177 p
Avail: Univ. Microfilms Order No. 7824866

A study of dispersed-annular air-water mixtures flowing vertically upward through a round duct and a converging nozzle was performed. A one-dimensional, separated phase flow model was developed to predict the flow behavior through a converging nozzle. The model results were compared with those obtained experimentally. Experimental studies were performed on the propagation of pressure pulses through the two phase mixtures. These results, in conjunction with the changes in pressure gradient with flow quality which occurred for these flows, show support for the use of a separated phase flow model and indicates a range of applicability for the flow model. The flow model was used to predict the variation of flow properties through a converging nozzle for both subcritical and critical two phase flows. Good agreement between the experimental and analytical results was obtained with generally better results for the subcritical flow cases. Dissert. Abstr.

N79-16219 Alsthom Techniques des Fluides, Grenoble (France). Lab. d'Hydrodynamique et Hydroelasticite.
UTILISATION OF THE SUPERCAVITATION FOR FLOW CONTROL Final Report [UTILISATION DE LA SUPERCAVITATION POUR LE CONTROLE D'UN ECOULEMENT]
Bernard Valisbouse and Jacques Genevey Apr. 1977 121 p In FRENCH
(Contract DGRST-75-7-1392)
(Rept-12-862) Avail: NTIS HC A06

A device which has no moving parts, requires no outside energy source, and which can be affixed to hydraulic circuits is described. No flow perturbation is required for normal operation, but when conditions pass a certain pre-set limit, supercavitation occurs and limits the flow. The flow is then controlled by the device and becomes independent of downstream pressure. Methods used to verify the principle of the apparatus are discussed as well as studies of those shapes which permit supercavitation while avoiding the inconveniences generally provoked by cavitation. Static functioning tests indicate reliability and long durability. The device may be used on all circuits designed to limit flooding in the case of pipe rupture, limit equilibrium between different branches of circuits, limit the return flow by static valve effect, and to protect upstream elements from cavitation. Three uses of the device are demonstrated. Transl. by A.R.H.

N79-16220# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
ADVANCED MEASUREMENT TECHNIQUES IN FLUID DYNAMICS, VOLUME 1
1977 328 p refs Proc. of Lectures held on 7-11 Mar. 1977 2 Vol.
(VKI-LS-96-Vol-1) Avail: NTIS HC A15/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

An up-to-date review is given of the following methods: (1) the use of hot-wire anemometers for measurements in highly turbulent flows, (2) advanced signal evaluation techniques, (3) the use of the laser Doppler anemometer, (4) system optimization for measurements, and (5) optical methods for the measurement of scalar quantities. For individual titles, see N79-16221 through N79-16224.

N79-16221# Cambridge Univ. (England). Whittle Lab.
INTERPRETATION OF HOT-WIRE PROBE SIGNALS IN SUBSONIC AIR FLOWS
H. H. Bruun *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 1 1977 60 p refs (For primary document see N79-16220 07-34)
Avail: NTIS HC A15/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

An accurate general heat transfer relationship for hot-wire probes in air flows has not yet been established. This investigation was undertaken to determine whether a general interpretation method could be established and evaluated by restricting the hot-wire probes to a given probe type used in connection with a specific anemometer type. The results presented demonstrate a validity of this approach and this paper contains a general discussion of the corresponding velocity component and temperature interpretation. L.S.

N79-16222# Cambridge Univ. (England). Whittle Lab.
EDUCTION OF COHERENT FLOW STRUCTURES. PART 1: PRESENTATION OF THE TIME-DOMAIN TECHNIQUE AND DERIVATION OF THE LARGE-SCALE FLOW STRUCTURE IN A MODERATE REYNOLDS NUMBER JET FLOW
H. H. Bruun *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 1 1977 75 p refs (For primary document see N79-16220 07-34)
Avail: NTIS HC A15/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

A new experimental time-domain technique is presented for the evaluation of the large-scale flow structure in a fluid flow. The technique is demonstrated by hot-wire anemometry for a circular jet flow at a moderate Reynolds number of 1000, and the identified large-scale structure is compared successfully with smoke flow-visualization observations. The temporal and spatial relationship of the separate large-scale flow events have been derived, and this information enabled the evaluation of the non-linear spatial development of the large-scale flow structure. L.S.

N79-16223# Cambridge Univ. (England). Whittle Lab.
EDUCTION OF COHERENT FLOW STRUCTURES. PART 2: DERIVATION OF THE LARGE-SCALE FLOW STRUCTURE IN TURBULENT JET FLOWS
H. H. Bruun *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 1 1977 91 p refs (For primary document see N79-16220 07-34)
Avail: NTIS HC A15/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

An investigation is described of the large-scale flow processes which occur in a turbulent circular jet flow. A new time domain technique in conjunction with X hot-wire and circumferential eductions was used to evaluate the spatial and temporal variations of the large-scale flow processes in the potential core and in the mixing region of the jet flow. The results obtained demonstrate a rapid change in the flow structure in the axial region X/D less than 2, and the establishment of a semiregular flow structure in the axial region X/D approximately equal to 2. L.S.

N79-16224# Cambridge Univ. (England).
A REVIEW OF CONVENTIONAL AND SOME ADVANCES HOT-WIRE MEASUREMENTS AND, THEIR PHYSICAL

INTERPRETATION
H. H. Bruun *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 1 1977 86 p refs (For primary document see N79-16220 07-34)
Avail: NTIS HC A15/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

In discussing the application of hot-wire anemometry for the study of 'turbulence', particular emphasis was put on the physical interpretation of hot-wire probe signals. This lecture represents an attempt to assess and reformulate the approach to fundamental turbulent research. L.S.

N79-16225# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
ADVANCED MEASUREMENT TECHNIQUES IN FLUID DYNAMICS, VOLUME 2
1977 286 p refs Proc. of Lectures held on 7-11 Mar. 1977 2 Vol.
(VKI-LS-96-Vol-2) Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

Flow velocity measurements utilizing laser Doppler anemometers is considered. Measurements in single and two phase flows, blood flow, reciprocating engines, and flames are included. Various signal analysis techniques are described. For individual titles, see N79-16226 through N79-16232.

N79-16226# Karlsruhe Univ. (West Germany).
VISUAL MODELING OF LASER DOPPLER ANEMOMETER SIGNALS BY MEANS OF MOIRE FRINGES
F. Durst and W. H. Stevenson *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. in Fluid Dyn., Vol. 2 1977 43 p refs (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

The employment of moire patterns to visually model interference phenomena in general and laser Doppler anemometer signals in particular is described. This modeling includes signals created in dual beam and reference beam anemometers by both single particles and particle pairs. The fringe model of the laser Doppler anemometer is also considered and moire patterns are employed to demonstrate the interference fringes in the crossover region of two intersecting laser beams. Gaussian beam properties are taken into account to allow the effects of improperly designed optical systems to be studied. Instructions for using computer generated transparencies to produce the different moire patterns are provided. J.M.S.

N79-16227# Karlsruhe Univ. (West Germany).
LASER DOPPLER ANEMOMETRY IN SINGLE AND TWO-PHASE FLOWS: A REVIEW
F. Durst *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 89 p refs (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

The basic principles of laser Doppler anemometry (LDA) are outlined. Moire fringe patterns are used in order to visually model LDA signals and to explain the basic difference in optical systems. It is pointed out that in highly turbulent and two phase flows LDA measurements should only be attempted with direction sensitive instruments. The usefulness of laser Doppler anemometry in two phase flows is demonstrated through velocity measurements of bubbles, droplets, and solid spheres as well as measurements in flows in which bubbles or particles are carried along. Ideas for extracting particle size and particle concentration from laser Doppler signals are discussed along with limits of optical techniques for investigations in two phase flows. J.M.S.

N79-16228# Imperial Coll. of Science and Technology, London (England).
LASER DOPPLER MICROSCOPE FOR BLOOD VELOCITY MEASUREMENTS
A. Melling and J. H. Whitelaw *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 29 p refs Sponsored by Brit. Heart Found. (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

The measurement of velocity profiles in blood vessels of a mouse mesentery is considered with emphasis on the optical design of the laser anemometer. Tests of the laser Doppler microscope in water flow, in the mouse mesentery, and different concentrations of diluted blood are described. Results are discussed. J.M.S.

N79-16229# Imperial Coll. of Science and Technology, London (England).
TURBULENCE CHARACTERISTICS OF THE FLOW DOWNSTREAM OF A SYMMETRIC, PLANE SUDDEN EXPANSION
A. Restivo and J. H. Whitelaw *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 20 p refs Sponsored partly by Sci. Res. Council, Port. Comissao Perm. Invotan, and Inst. Nacl. de Invest. Cient. (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

Measured values of the distribution of mean axial velocity, the rms of the corresponding fluctuations and energy spectra are reported in the region downstream of symmetric, plane sudden expansion. The results relate mainly to an expansion ratio of 3 but include results with a ratio of 2. The Reynolds numbers extend to 3865 and encompass a range of initial conditions from laminar to turbulent. The results are consistent with those of related investigations and, in addition, demonstrate the existence of asymmetry of the flow and its relationship to the growth of disturbance in the shear layers even at the comparatively high Reynolds numbers. It is argued that the length of the two regions of recirculation are related to each other and to the wavelength of the disturbance; these lengths are almost constant at high Reynolds numbers and this is explained. Author

N79-16230# Imperial Coll. of Science and Technology, London (England).
DESIGN OF LASER DOPPLER ANEMOMETERS FOR RECIPROCATING ENGINES
A. Melling and J. H. Whitelaw *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 47 p refs Sponsored by Sci. Res. Council (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

The optical and signal processing systems of laser Doppler anemometers which have been designed to allow velocity measurements in motored reciprocating engines are described. These measurements are required in two engines: a low speed model having a transparent glass cylinder, and a commercial diesel engine modified to permit optical access. The characteristics of the engines are described with particular reference to those features affecting the flow pattern within the cylinder. Comments on the difficulties likely in the latter engine, and on the relative merits of the systems proposed are included. J.M.S.

N79-16231# Imperial Coll. of Science and Technology, London (England).
INVESTIGATION OF A V-GUTTER STABILIZED FLAME BY LASER ANEMOMETRY AND SCHLIEREN PHOTOGRAPHY
H. Clare (Natl. Gas Turbine Estab.), D. F. G. Durao, A. Melling, and J. H. Whitelaw *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 10 p refs Sponsored by Min. of Defence (For primary document see N79-16225 07-34)
Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

Laser Doppler anemometry was used to study premixed propane-air flames stabilized on a V-gutter, both in smooth combustion and in buzz. Axial velocity measurements in the wake of the gutter were made in an isothermal flow and in a combusting flow to examine the influence of combustion on the velocity distribution and the recirculation zone length. Velocities outside the wake in a moderate buzz condition were measured, but velocity pulsations corresponding to the regular fluctuations in static pressure observed by means of a pressure transducer mounted in the duct wall could not be detected by the technique used. Both the schlieren and pressure measuring techniques require only fairly short sampling times to provide a large amount of information. Schlieren photography is used only qualitatively,

however, while pressure recording refers to conditions at the duct wall. The laser anemometry technique requires significantly longer operating times, but more detailed velocity mapping by this method would quantify flow features shown qualitatively in the schlieren films and relate conditions in the main flow to pressure pulsations measured at the duct wall. J.M.S.

N79-16232# Imperial Coll. of Science and Technology, London (England).

LDA SIGNAL PROCESSING AND DATA ANALYSIS

J. H. Whitelaw *In* Von Karman Inst. for Fluid Dyn. Advan. Meas. Tech. in Fluid Dyn., Vol. 2 1977 18 p refs (For primary document see N79-16225 07-34)

Avail: NTIS HC A13/MF A01; Von Karman Inst. for Fluid Dyn. BF 4,500

The form of electrical signals produced by the photodetector is described along with the requirements of signal processing systems. The principles of operation and relative merits of the more important methods of signal analysis are discussed. These include: frequency analysis; frequency-tracking demodulation; counting; filter banks; photon correlation spectroscopy; and optical frequency analysis. It is concluded that Doppler signals may vary in amplitude, frequency, and phase, and that the recommended form of signal analysis depends on the required flow properties and on the flow configuration. J.M.S.

N79-16233# Societe Anonyme Belge de Constructions Aeronautiques, Brussels (Belgium).

DESIGN AND DEVELOPMENT OF A HIGH PERFORMANCE VARIABLE CONDUCTANCE HEAT PIPE Final Report for First Phase

J. P. Mathieu, B. Moschetti, Giovannini, and E. Cavelier Paris ESA Jul. 1977 145 p Prepared jointly with Soc. Natl. Ind. Aerospatiale, Cannes, France

(Contract ESTEC-3007/76-NL-PP(SC))

(ESA-CR(P)-1135) Avail: NTIS HC A07/MF A01

The development of a variable conductance heat pipe controlled by a wicked cold gas reservoir is reported. The heat pipe has to transport 100 watt. meter and its tube diameter is limited to 10mm. An application involving the heat pipe, the reservoir, and a cooling fin was also studied. The control mechanism should adjust the vapor temperature between 15 and 10 C when the transferred power varies fron 2 to 120W. The control behavior was examined according to three methods: the flat front model, the diffuse front correction, and the multinode mathematical analysis. Author (ESA)

N79-16234# European Space Research and Technology Center, Noordwijk (Netherlands).

A HEAT-TRANSPROT SYSTEM EMPLOYING A VAPOUR-PRESSURE PUMP

P. Tamburini Paris ESA Jun. 1978 32 p

(ESA-STR-201) Avail: NTIS HC A03/MF A01

A new kind of heat-transport system is reported that lacks moving mechanical parts, requires no external source of power, maintains a constant temperature, and has self-priming and depriming characteristics. These main features make the system particularly attractive for thermal-control purposes both in space and on earth. The working of a prototype model is discussed, with some qualitative assessment of performance. The application of the system to the thermal control of Spacelab payloads and to solar-energy collection is briefly evaluated. G.G.

N79-16235# Fiat S.p.A., Turin (Italy).

FLUID PHYSICS MODULE Final Report

C. Alessio, R. Cerrato, C. d'Adda, G. Levizzari, G. Martinelli, G. Ceronetti, and G. Antonucci Paris ESA Dec. 1977 266 p refs Partly in ENGLISH, partly in ITALIAN, partly in FRENCH

(Contract ESA-3222/77-F-HGE(SC))

(ESA-CR(P)-1114) Avail: NTIS HC A12/MF A01

Engineering drawings are presented for a module designed for making experiments on liquids under low gravity conditions during Spacelab missions. The module consists mainly of a structure with two disks which can rotate separately at different speeds and between which a column of liquid will be set up. One of the two discs moves axially on a slide. The size of the column depends on the combined movement of this disc and the tank assembled on a separate slide. The second disc can be moved laterally and subjected to an axial vibration with variable amplitude frequency. Temperature gradients and differences in electric potential can also be created between the two discs. Experiments can be made on spherical liquid shapes on one of the discs using additional equipment supplied by the experiments. The liquid is taken from the tank to an air-tight test chamber. One auxiliary system is used for detecting the shape and size of the liquid column and the local velocity of the moving liquid. The second removes the liquid if the column breaks and brings local temperatures back to the safety level after performing experiments requiring heating of one of the disks. A.R.H.

N79-16236# Stuttgart Univ. (West Germany). Energy Conversion and Heat Transfer Div.

DESIGN AND DEVELOPMENT OF A HEAT PIPE DIODE. PHASE 2: DEVELOPMENT AND PERFORMANCE TESTING Final Report

M. Groll, W. D. Muenzel et al Paris ESA May 1978 115 p refs

(Contract ESTEC-2993/76-NL-PP(SC))

(ESA-CR(P)-1134) Avail: NTIS HC A06/MF A01

Two types of diodes, both employing the liquid trap technique were developed. One is an all-aluminum axial groove design, and the other is an all-stainless steel artery design. Ammonia was used as the working fluid in both cases. Three diodes of the axial groove design, one straight development model and one straight and one bent prototype diode, were built. One straight development model of the arterial design was built. The test program for both types of diodes was essentially the same. It comprised: forward-mode performance as a function of operating temperature and evaporator elevation; transient shutdown behavior; and restart from the shutdown condition. J.M.S.

N79-16237# Admiralty Underwater Weapons Establishment, Portland (England).

DIFFRACTION AROUND FINITE PLANAR BAFFLES

D. T. Wilton Jun. 1978 33 p refs

(AUWE-46291; BR64757) Avail: NTIS HC A03/MF A01

The diffraction of sound around the edge of a half plane is considered in order to gain some insight into the effect of positioning sonar arrays on or near finite baffles. Some useful approximations are derived and demonstrated for the pressure levels due to a single source at endfire and also directly behind both soft and hard baffles. Comparisons are made with the assumption of an infinite baffle and the usual approximation for dealing with an array on a finite hard baffle is questioned. G.Y.

N79-16238# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.

AN EXPERIMENTAL INVESTIGATION INTO THE INFLUENCE OF ACOUSTIC DISTURBANCES ON THE DEVELOPMENT OF A TURBULENT BOUNDARY LAYER

D. J. Weeks and J. Hodges London Aeron. Res. Council 1978 41 p refs Supersedes RAE-TR-77035; ARC-37524

(ARC-R/M-3825; BR64877; RAE-TR-77035; ARC-37524)

Avail: NTIS HC A03/MF A01; HMSO £ 5; PHI

The effects of acoustic disturbances on the mean flow in a turbulent boundary layer developing in a mildly favorable pressure gradient are discussed. A Hartmann generator, mounted on the center line of a transonic wind tunnel, was used as a noise source, and the mean flow in the boundary layer on the tunnel sidewall was examined for any effects of the noise. It was not possible to identify any effect of the noise itself on the boundary layer. It is concluded that the acoustic disturbances generally found in the working sections of transonic wind tunnels are likely to exert a measurable influence on the development of turbulent boundary layers. G.G.

N79-16239# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flugkoerperantriebe.

THE DETERMINATION OF MOMENTUM, HEAT, AND MASS TRANSPORT IN THE HIGHLY TURBULENT MIXING REGION OF HIGH VELOCITY AND HOT GAS JETS

Helmut Hardegen 7 Oct. 1977 38 p refs

(DLR-FB-77-44) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 20,30

A measurement technique was developed. The processor-

controlled application of a modified total hydrocarbon analyzer (with hydrocarbons as tracer gas) in conjunction with specially developed auxiliary devices, provides high measuring accuracy, short measuring-time, low cost and easy operation. G.G.

N79-16240# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Stroemungsmechanik.

MEASURING TECHNIQUES FOR COMPRESSIBLE TURBULENT BOUNDARY LAYERS

Hans Ulrich Meier 22 Nov. 1977 41 p refs Presented at the Von Karman Inst. Lecture Ser. Compressible Turbulent Boundary Layers, Brussels, 1-5 Mar. 1976

(DLR-FB-77-49) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 18,90

A survey of probes for the measurement of mean flow quantities like total and static pressure, total temperature and mass flow in supersonic turbulent boundary layers is given. Their special applications as well as their short comings are pointed out. Possible probe corrections which should be applied under particular flow conditions are discussed. Hot wire and Laser Doppler anemometer are described briefly. The application of these measuring techniques for the determination of velocity, mass flow and total temperature fluctuations is shown and some results of measurements are reported. G.Y.

N79-16241# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE FLOW AT THE INLET OF THE VANED DIFFUSER FOR A HIGH PRESSURE RATIO CENTRIFUGAL COMPRESSOR

G. Verdonk Mar. 1978 62 p refs

(VKI-TN-125) Avail: NTIS HC A04/MF A01

A theoretical and experimental investigation of the flow in the vaneless and semi-vaneless space of a transonic radial compressor diffuser, especially for working points corresponding to the mass flow below choking values is examined. A type-dependent finite difference calculation was developed for the inviscid flow. This method was combined with a shock-boundary layer interaction theory, which allowed calculation in a more realistic way. The velocity distribution took into account the boundary layer variation along the sidewalls. J.A.M.

N79-16242# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

FILM COOLING AND END WALL HEAT TRANSFER IN SMALL TURBINE BLADE PASSAGES

J. P. Ville, M. Godard, B. E. Richards, and G. Sieverding Feb. 1978 48 p refs

(VKI-TN-126) Avail: NTIS HC A03/MF A01

Topics related to the cooling of the end wall of a turbine passage were studied. The first concerns the development of a method for measuring the adiabatic wall effectiveness and heat transfer coefficient of a film cooling system for protecting a surface from high heating derived from a hot compressible flow. The second concerns the measurement of the heat transfer rate distribution to a turbine cascade end wall in order to choose an appropriate film cooling system. J.M.S.

N79-16243# Centre National d'Etudes Spatiales, Toulouse (France).

RITZ SOFTWARE: DYNAMIC ANALYSIS OF STRUCTURES OF REVOLUTION CONTAINING FLUIDS [LOGICIEL RITZ - ANALYSE DYNAMIQUE DE STRUCTURES DE REVOLUTION CONTENANT DES LIQUIDES]

Nicolas Fernandez Sep. 1978 312 p refs In FRENCH; ENGLISH summary

(CNES-NT-84) Avail: NTIS HC A14/MF A01

The method and corresponding program used to compute the dynamic characteristics of structures of revolution containing fluids are presented. The structure is broken down into simple elements for which the displacement field is described by orthogonal polynomials which are adapted to the geometry of the structure and whose degrees can be chosen to obtain desired accuracy. An original feature of the program is that the energy of the fluid is evaluated globally as a function of the shell displacement coordinates alone, without needing to introduce degrees of freedom in the liquid. Uses of the program include computing dynamic characteristics of liquid propellant launch vehicles (European launcher ARIANE) to help solve problems arising in payload dynamic coupling, and analyzing and controlling POGO effects. A.R.H.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N79-16244 Rensselaer Polytechnic Inst., Troy, N. Y.

SURFACE AND INTERFACIAL TENSIONS OF CONJUGATE SOLUTIONS IN ISOTHERMAL TERNARY SYSTEMS Ph.D. Thesis

Robert Edward Patterson 1978 161 p

Avail: Univ. Microfilms Order No. 7900236

A high-precision apparatus was constructed to measure surface and interfacial tensions of liquids by the pendant-drop technique. The method requires control of temperature, photographic recording of the drop, precise measurement of dimensions, and the use of a computer to determine the surface tensions from the data input. The surface and interfacial tensions of conjugate solutions of compositions located in the isothermal miscibility gap of two ternary systems were measured. The systems investigated were benzene-water-ethanol and n-hexane-water-ethanol at 20.0 C. Results confirm the theory that the defoaming of one of a pair of conjugate solutions by its equilibrium conjugate corresponds with a positive sign of its final spreading coefficient, as calculated from measured surface and interfacial tensions. Dissert. Abstr.

N79-16245 Cornell Univ., Ithaca, N. Y.

DIGITAL IMAGE PROCESSING IN ION MICROSCOPY Ph.D. Thesis

John David Fassett 1978 157 p

Avail: Univ. Microfilms Order No. 7902265

The quantization of ion micrographs is described. The development of a system that handles ion micrographs and the subsequent usage of this system are investigated. The system combines microphotodensitometry and digital image processing. A procedure was established for the determination of the characteristic curve for ion micrograph film. A computer program was written specifically to handle ion micrographs. Primarily in FORTRAN and utilizing the overlay facility of RT-11, this program contains a broad set of display, image analysis, complex mathematical, and ion micrograph specific routines. Several specific applications utilizing ion micrographs were demonstrated with the system. Dissert. Abstr.

N79-16246* National Aeronautics and Space Administration. Pasadena Office, Calif.

THERMOMAGNETIC RECORDING AND MAGNETIC-OPTIC PLAYBACK SYSTEM Patent

George W. Lewicki (JPL) and John E. Guisinger, inventors (to NASA) (JPL) Issued 7 Dec. 1971 5 p Filed 10 Mar. 1969 Sponsored by NASA

(NASA-Case-NPO-10872-1; US-Patent-3,626,114; US-Patent-Appl-SN-805549; US-Patent-Class-179-100.2CH; US-Patent-Class-340-174.1M; US-Patent-Class-346-74MT) Avail: US Patent and Trademark Office. CSCL 14E

A magnetic recording and magneto-optic playback system is disclosed wherein thermomagnetic recording is employed. A transparent isotropic film is heated along a continuous path by a focused laser beam. As each successive area of the path is heated locally to the vicinity of its Curie point in the presence of an applied magnetic field, a magneto-optic density is established proportional to the magnetic field and fixed in place as the area cools once the laser beam moves on to an adjacent area. To play back the recorded data, the intensity of the laser beam is reduced to avoid reaching the vicinity of the Curie point of the

film as it is scanned by the laser beam in the same manner as for recording. A Faraday effect analyzer and photo detector are employed as a transducer for producing an output signal.
Official Gazette of the U.S. Patent and Trademark Office

N79-16247 National Bureau of Standards, Boulder, Colo. Cryogenics Div.
AN EVALUATION OF COMMERCIAL DENSIMETERS FOR USE IN LNG
J. D. Siegwarth, B. A. Younglove, and J. F. LaBrecque Oct. 1977 48 p refs Prepared for Am. Gas Assoc., Inc.
(NBS-TN-697) Avail: SOD HC $2.20 as C13.46:697

The cryogenic fluids density reference system was used to evaluate three basic types of densimeters: the vibrating element type, the dielectric cell type and the displacement type. These meters were used to measure densities in liquid methane and liquid methane mixtures with ethane, propane, normal butane, and nitrogen. Measurements were made over the density range from 400 to 480 kg/ cu m, temperatures from 108 K to 130 K, and pressures from 1 to 3 bar. A hundred measurements were made at various densities, temperatures, pressures and compositions. Author

N79-16248 Royal Observatory, Edinburgh (Scotland).
ASTRONOMICAL PHOTOGRAPHY: A BIBLIOGRAPHY
Elisabeth M. Sim Sep. 1977 63 p refs
Avail: NTIS HC A04

This bibliography lists 512 references covering publications of interest to astronomers using photographic techniques. General topics covered include hypersensitization, materials and emulsions, storage, processing, measurement, image formation, structure of the developed image, information detection and storage, color, and photolaboratory techniques and theory. J.M.S.

N79-16249# Fulmer Research Inst. Ltd., Stoke Poges (England).
THERMOCOUPLES AND THERMOCOUPLE ATTACHMENT METHODS Final Report
J. C. Kevern, R. M. Waghorne, B. A. Hatt, and J. K. R. Page Paris ESA Jul. 1978 48 p
(Contract ESTEC-2732/76)
(ESA-CR(P)-1130) Avail: NTIS HC A03/MF A01

Surface analyses by X-ray photoelectron spectroscopy were applied to assess the relative efficiencies of different solvents used in surface preparation and cleaning. These results were correlated with the performance during thermal cycling/adhesion testing of similarly prepared T/C-substrate combinations using three adhesives. Surface analysis techniques were also used with selected substrates to compare the degrees of surface cleanliness which can be attained by repeated applications of the standard preparation method with one solvent. Practical techniques for surface preparation were developed for use with Teflon type substrates. G.Y.

N79-16250# Admiralty Underwater Weapons Establishment, Portland (England).
A DESCRIPTION OF A ROBUST DIGITAL RECORDING SYSTEM
A. Coman Jun. 1978 17 p
(AUWE-TN-584/78; BR64756) Avail: NTIS HC A02/MF A01

The digital data recording system was used as the only recording medium on two trials. The equipment was reliable and was subjected to 20 high g shocks. On one occasion, the equipment was shocked beyond specification when the launching equipment failed to release correctly. The system faithfully recorded the disaster. Owing to the limited capacity of the recording system, it was necessary to consider carefully what to record and how often. J.A.M.

N79-16251# Royal Aircraft Establishment, Farnborough (England).
A SURVEY OF SHUTTERING TECHNIQUES FOR THE RAE HIGH-SPEED TELEVISION RECORDING SYSTEM
R. W. Corbin Nov. 1977 23 p refs
(RAE-TM-IT-161; BR61670) Avail: NTIS HC A02/MF A01

Mechanical rotating disc shutters are currently used with the high speed television camera system but a more compact device, capable of exposure times down to 50 microseconds, would be highly desirable. The suitability of electro-optical shuttering devices is discussed for this application and typical performance figures are given. It is concluded that image intensifiers of the electrostatically focused diode types, fibre optically coupled to a Plumbicon camera tube, offer sufficient promise to justify further work. G.Y.

N79-16252# Royal Aircraft Establishment, Farnborough (England).
STORAGE OF EKTACHROME INFRA-RED FILM
D. M. Fox Oct. 1977 12 p refs
(RAE-TM-IT-167; BR59870) Avail: NTIS HC A02/MF A01

Experiments to establish the effects of storage less ideal than that recommended by the manufacturer - i.e. that it is kept in a freezer at -18 to -20 C, have shown that even after one year's storage at 4 C, the infrared layer retains sufficient sensitivity for use in emergencies. G.G.

N79-16020*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DSN WATER VAPOR RADIOMETER DEVELOPMENT: RECENT WORK, 1978
P. D. Batelaan and S. D. Slobin *In its* The Deep Space Network 15 Dec. 1978 p 129-135 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-16253 Maryland Univ., College Park.
LASER RADIATION-GAS DYNAMIC COUPLING IN THE SF6-AIR LAMINAR BOUNDARY LAYER ON A BLUNT BODY Ph.D. Thesis
Jerry Lee Wagner 1978 254 p
Avail: Univ. Microfilms Order No. 7900933

Numerical results are presented for the radiative gas-dynamic interaction associated with CO2 laser radiation absorption in the SF6-air laminar compressible boundary layer around a flat plate. Detailed boundary layer profiles and the variation of radiative intensity are obtained. The effects of the radiation on boundary layer properties such as optical thickness, displacement thickness, density-viscosity ratio, skin friction, heat ,transfer, Prandtl number and Lewis number are included. The stagnation point results clearly show the physical trends and properties associated with this radiatively coupled flow. These stagnation point solutions have been obtained with varying mass injection rate of SF6, intensity of the laser radiation at the edge of the boundary layer, Mach number, and radius of curvature. In the results, strong coupling effects are observed, induced by laser heating of the gas. The downstream results include the flow around a sphere and a spheroid. Dissert. Abstr.

N79-16254 Arizona Univ., Tucson.
PICOSECOND OPTICAL PHENOMENA OF LASER INDUCED ELECTRON-HOLE PLASMA IN SEMICONDUCTORS Ph.D. Thesis
Thomas Chung Yee Leung 1978 154 p
Avail: Univ. Microfilms Order No. 7901727

The generation and temporal evolution of the dense, nonequilibrium electron-hole plasma produced in germanium by the absorption of intense, picosecond optical pulses is considered. This is done by revising and extending the physical model proposed by Elci, Scully, Smirl and Matter, such that transient optical phenomena observed in experiments can be better accounted for. It is found that a major assumption (the spatially homogeneous assumption) should be relaxed, and some fundamental processes: inter-valence band absorption, diffusion, Auger recombination should be added. It is shown that new experimental (reflectivity of excitation pulse, transmission of samples of various thicknesses) results can be satisfactorily explained by these extensions. Dissert. Abstr.

N79-16255*# North Carolina Agricultural and Technical State Univ., Greensboro.
INVESTIGATION OF LASER INDUCED PARAMETRIC INTERACTIONS IN OPTICAL WAVEGUIDES AND FIBERS

Final Report, 15 Oct. 1977 - 15 Oct. 1978
Chung Yu 1978 52 p refs
(Grant NsG-1346)
(NASA-CR-158083) Avail: NTIS HC A04/MF A01 CSCL 20E

Experimental and theoretical aspects of the laser pump depletion characteristics in an optical fiber due to stimulated Raman scattering, and stimulated Brillion scattering were studied. A review is presented of research in fiber transmission accompanied by stimulated scattering. Results of experimental work with tunable dye lasers and argon lasers are presented. The spectral profiles of the laser pump and its transmitted light through the fiber are given. F.O.S.

N79-16256# Royal Aircraft Establishment, Farnborough (England).
SOME CHARACTERISTICS OF THE PARTICLES USED IN LASER ANEMOMETRY APPLICATIONS AT RAE
P. Sharpe May 1978 39 p refs
(RAE-TR-78055; BR64224) Avail: NTIS HC A03/MF A01

A knowledge of some of the characteristics of the particles used in laser anemometry experiments is of considerable importance if the results obtained are to be interpreted with confidence. Problems associated with the determination of this quantity are discussed, relevant aspects of the scattering of light by spherical particles are briefly summarized and the results of some laboratory experiments are presented. It is shown that the seeding technique used at present, based on a commercial oil-mist generator, gives satisfactory results for most laser anemometry applications of interest. G.Y.

N79-16017*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
S-BAND MASER PHASE DELAY STABILITY TESTS
J. M. Urech, F. Alcazar, J. Galvez, A. Rius, and C. A. Greenhall *In its* The Deep Space Network 15 Dec. 1978 p 102-117 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-16257 Texas Univ. at Austin.
THE SMALL MOTION DYNAMICS OF BILATERALLY COUPLED KINEMATIC CHAINS WITH FLEXIBLE LINKS Ph.D. Thesis
William George Beazley 1978 185 p
Avail: Univ. Microfilms Order No. 7900533

Mechanisms with both lower and higher order kinematic pairs and flexible links in a three dimensional configuration were simulated by extending the method of transfer matrices to include such devices. The machine is divided into two parts. One consists of a lower pair chain containing only lower order pairs and associated links. The other part is the remainder, termed a coupling between the links of the chain. A coordinate transformation transfer matrix allows the link-link relative geometry of the grossly deflected kinematic joint to be included as another beam component encountered along the chain, while beam end variables which differ across the joint are extracted and handled separately. A transfer matrix is constructed and compared to static and dynamic test results for a six degree of freedom, mechanically coupled, master-slave remote manipulator. Dissert. Abstr.

N79-16258 Rutgers - The State Univ., New Brunswick, N. J.
DURABILITY, STRENGTH AND SHEAR TRANSFER CHARACTERISTICS OF IMPROVED POLYMER MODIFIED CONCRETES FOR CONCRETE STRUCTURAL SYSTEMS Ph.D. Thesis
Maurice Maduakonam Ukadike 1978 421 p
Avail: Univ. Microfilms Order No. 7901318

A polymer system usable for the improvement of concrete characteristics is identified. The quantity of this polymer in a modified concrete system is optimized with respect to strength and workability. Practical applications where this polymer modified concrete (PMC) could be used most advantageously are suggested. Analytical expressions are developed based on a shear transfer hypothesis for the use of the material in structural systems. Typical applications are investigated, and recommendations presented. The optimum ratio of polymer to cement in the PMC for a given water/cement ratio less than 0.6, was found to be 0.3 to 0.4. By replacing some mixing water with polymer, 28 day cylinder strengths were increased from 5600 psi to 13,500 psi (compressive), and from 500 psi to 1500 psi (tensile splitting), without any loss in workability. An improved PMC mixing method yielded an additional increase of up to 20%. Dissert. Abstr.

N79-16259 Rensselaer Polytechnic Inst., Troy, N. Y.
A NUMERICAL SOLUTION FOR A GENERALIZED ELLIPTICAL CONTACT OF LAYERED ELASTIC SOLIDS Ph.D. Thesis
John Atwater McCormick 1978 152 p
Avail: Univ. Microfilms Order No. 7900231

A numerical method is developed to compute the pressure distribution and normal approach in a generalized elliptical contact between layered linearly elastic solids. The method is applied to the contact between a homogeneous solid and a layered solid consisting of an isotropic surface layer of uniform thickness in perfect adhesion to an isotropic substrate. Solutions obtained for three sets of material properties over ranges of the contact zone ellipticity ratio and major halfwidth to layer thickness ratio are given as plots which show the major and minor halfwidths, approach, and central pressure as functions of layer thickness at fixed load and fixed principle curvature ratio of the parabolic separation. As the layer thickness decreases, the contact zone ellipticity ratio is found to increase for a high modulus layer bonded to a low modulus substrate and decrease for a low modulus layer bonded to a high modulus substrate.
Dissert. Abstr.

N79-16260# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
CLOSED CYCLE GAS TURBINES, VOLUME 1
1977 381 p refs Proc. of Lectures held on 9-13 May, 1977 2 Vol.
(VKI-LS-100-Vol-1) Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

High power and low power closed cycle turbines are studied. The following topics are discussed: (1) large closed cycle gas turbine plants; (2) the use of liquid natural gas as heat sink for power cycles; (3) the development of thermal prime movers for heat pump drive; and (4) dissociating gases of working fluids. For individual titles, see N79-16261 through N79-16264.

N79-16261# General Atomic Co., San Diego, Calif. **c05**
LARGE CLOSED-CYCLE GAS TURBINE PLANT
Colin F. McDonald *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbine, Vol. 1 1977 265 p refs (For primary document see N79-16260 07-37)
(Contract E(04-3)-167; Gen. Atomic Proj. 2095; Gen. Atomic Proj. 4351; Gen. Atomic Proj. 3227)
(GA-A-14311) Copyright. Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

A plant with a high temperature gas cooled reactor (HTGR) as the heat source is designed. The design evolution for a large nuclear closed-cycle gas turbine power plant is summarized. A background on closed-cycle gas turbines, the incentives for the GT-HTGR, cycle selection, plant configuration studies, performance, selection of a reference plant design, component design activities, and a description of the waste heat binary power plant are presented. Development and testing alternatives, and related international programs in the closed-cycle gas turbine field are included. S.E.S.

N79-16262# Politecnico di Milano (Italy). Ist. di Macchine.
THE USE OF LIQUID NATURAL GAS AS HEAT SINK FOR POWER CYCLES
G. Angelino *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol. 1 1977 40 p refs (For primary document see N79-16260 07-37)
Copyright. Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

The thermodynamics of power cycles employing LNG as heat sink is discussed. Condensation cycles in simple or in

elaborate versions, employing non-toxic, non-flammable, inert organic working fluids (CF4, C2F6, CHF3, C3F8), yield the best overall performance for LNG vaporization at subcritical pressure. For supercritical vaporization, heat rejection from Brayton cycles naturally fits heat sink thermal characteristics, which results in a particularly high efficiency for closed gas cycles. If only a fraction of the cooling capability of LNG is devoted to power uses, condensation cycles are superior to gas cycles even at supercritical LNG pressures. Under the most favourable circumstances gas cycles achieve efficiencies of around 60 percent, while some elaborate condensation cycles attain the 70 percent level. Author

N79-16263# Politecnico di Milano (Italy). Ist. di Macchine.
DEVELOPMENT OF THERMAL PRIME MOVERS FOR HEAT PUMP DRIVE
G. Angelino *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol. 1 1977 25 p refs (For primary document see N79-16260 07-37)
Copyright. Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

The energy savings connected with low grade heat generation by means of heat pumps powered by thermal engines whose waste heat is recovered are illustrated. The performance of the system is compared with that of alternate methods of low temperature heat production. The characteristics of thermal prime movers adequate for the proposed application which are either available or under development are reviewed. Particular attention is devoted to organic working fluid cycles whose basic thermodynamics and main technical features are discussed. Results are reported of an example of technical and economical analysis relating to the heating of a large building by means of a thermal engine-heat pump system. Author

N79-16264# Politecnico di Milano (Italy). Ist. di Macchine.
DISSOCIATING GASES AS WORKING FLUIDS FOR POWER CYCLES
G. Angelino *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol. 1 1977 41 p refs (For primary document see N79-16260 07-37)
Copyright. Avail: NTIS HC A16/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

Nitrogen tetroxide is tested for its thermodynamic properties. The performance of gas and condensing cycles was evaluated. Material selection and corrosion problems were investigated. S.E.S.

N79-16265# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
CLOSED CYCLE GAS TURBINES, VOLUME 2
1977 254 p refs Proc. of Lectures held on 9-13 May, 1977 2 Vol.
(VKI-LS-100-Vol-2) Avail: NTIS HC A12/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

Volume 2 of a two volume set is presented. The following topics are reported: (1) the dynamic behavior of closed-cycle gas turbines; (2) design criteria for turbines operating with fluids having a low speed of sound; (3) power cycles and working fluids for low temparature heat sources; and (4) closed cycle gas turbine optimization, procedures and examples. For individual titles, see N79-16266 through N79-16269.

N79-16266# Gutehoffnungshuette Sterkrade AG, Oberhausen (West Germany).
THE DYNAMIC BEHAVIOR OF CLOSED-CYCLE GAS TURBINES
G. Krey *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol 2 1977 30 p (For primary document see N79-16265 07-37)
Copyright. Avail: NTIS HC A12/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

The entry of the closed-cycle gas turbine into the range of high unit capacities and the intended use of nuclear power as a source of energy have led to increased requirements in respect of the accuracy and reliability of layout and design. There resulted the necessity to develop methods allowing advance calculation of the dynamic behaviour of such plants. Knowledge of this behaviour is necessary to arrive at a better and safer design of the circuit components and to allow safety and control equipment which meets the specific operating requirements to be designed. Such a method, which was developed on the basis of measuring results, is the subject of this work. G.Y.

N79-16267# Politecnico di Milano (Italy). Inst. di Macchine.
DESIGN CRITERIA FOR TURBINES OPERATING WITH FLUIDS HAVING A LOW SPEED OF SOUND
E. Macchi *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol 2 1977 64 p refs (For primary document see N79-16265 07-37)
Copyright. Avail: NTIS HC A12/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

Fluid properties play such an important role on the turbine design, that the optimization of an organic fluid turbine stage is likely to yield solutions which can appear quite unusual for a steam or gas turbine designer. A lecture is presented to provide and discuss criteria for preliminary selection of design parameters. Such parameters include; speed of revolution, number of stages, triangles of velocity, number of blades, solidity, etc. G.Y.

N79-16268# Politecnico di Milano (Italy). Ist. di Macchine.
POWER CYCLES AND WORKING FLUIDS FOR LOW TEMPERATURE HEAT SOURCES
E. Macchi *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol 2 1977 44 p refs (For primary document see N79-16265 07-37)
Copyright. Avail: NTIS HC A12/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

By making use of proper working fluids and cycles, mechanical power can be economically obtained by relatively low-temperature heat sources. Some possible applications for these engines are reviewed. Choice criteria of working fluids and thermodynamic cycles for various heat sources temperatures and power outputs are discussed. Advantages of organic fields versus steam are evidenced, both from thermodynamic and expander design points of view. The possibility of obtaining efficient turbines even at very low power levels by making use of low condensation pressure is discussed. Experimental results of a recently developed 3 kW prototype engine for solar power application, operating between 75 and 30 C are presented. G.Y.

N79-16269# AiResearch Mfg. Co., Phoenix, Ariz.
CLOSED CYCLE GAS TURBINE OPTIMIZATION- PROCEDURES AND EXAMPLES
E. A. Mock *In* Von Karman Inst. for Fluid Dyn. Closed Cycle Gas Turbines, Vol 2 1977 112 p refs (For primary document see N79-16265 07-37)
Copyright. Avail: NTIS HC A12/MF A01; Von Karman Inst. for Fluid Dyn. BF 4.500

Considerable flexibility is available when adapting the closed cycle gas turbine to a particular application, and this same flexibility is required in the analysis procedures. These procedures must accurately predict the component and system performance. The cycle analysis procedures are discussed to show the basis and depth of the analyses. Also included are discussions of critical component configurations and performance characteristics that impact the suitability of a closed cycle gas turbine to a particular application. The results of detailed optimization studies for engines in the 1000 to 2000-hp class, including both single shaft and free turbine variations, are presented. Current engine designs and hardware descriptions for 1300 watt and 30 KW sub e systems are reviewed. G.Y.

N79-16270# Bari Univ. (Italy). Ist. di Macchine
ABOUT THE RUNNING IN OF INTERNAL COMBUSTION ENGINES
Luigi Vasciaveo and Luigi Terenzio 1977 21 p refs In ITALIAN; ENGLISH summary Presented at the 32d Natl. ATI Congr., Rome, 20-23 Sep. 1977
Avail: NTIS HC A02/MF A01

Although running in is now a common expression, there are no criteria to know the degree of running in and no test codes to run in internal combustion engines. The results of a set of tests carried out on a Wankel engine show that one can define the degree of running in and find test methods for running in, extensible also to the more frequent case of reciprocating engines. Author (ESA)

N79-16271# Societe Europeene de Propulsion, Vernon (France).
SURFACE TENSION TANK. STUDY OF DESIGN IMPROVEMENT AND FUNCTIONAL DEMONSTRATION Final Report
M. Robert Paris ESA 1978 29 p
(Contract ESTEC-3288/77-NL-AK(SC))
(SEP-TS/S/340/MR-30.358/78; ESA-CR(P)-1107) Avail: NTIS HC A03/MF A01

A surface tension tank for use with anhydrous hydrazine, monomethyl hydrazine, and nitrogen tetroxide at an operating pressure of 22 bar at 40 C was designed. Topics include data compilation, propellant management device optimization study, tank design study, stress analysis, and procedures for testing the plexiglass demonstration model. ESA

N79-16272# National Centre of Tribology, Risley (England). European Space Tribology Lab.
[ACTIVITIES OF THE EUROPEAN SPACE TRIBOLOGY LABORATORY] Progress Report, 1977
E. J. Robbins Paris ESA May 1978 26 p refs
(Contract ESTEC-2584/75-MD)
(ESA-ESTL-35; ESA-CR(P)-1119) Avail: NTIS HC A03/MF A01

Mechanism tests in 1977 included solar array drives by Hawker Siddeley Dynamics and by Marconi Space and Defence Systems, a despin mechanism by Dornier, a third model of the Teldix double gimballed momentum wheel, an antenna pointing mechanism by Marconi Space and Defence Systems, a Teldix stepper motor, OTS solar array drives, and evaluation of bearings for ISEE booms. The supporting development program involved thin metal film lubrication of ball bearings, performance of ball bearings at small angles of oscillation, ball bearing conformity, tests on ceramic ball bearings, rod end bearing evaluation, examination of bearings after life test, problems with oil lubricated ball bearings, and slip ring/brush tests. ESA

N79-16273# National Centre of Tribology, Risley (England). European Space Tribology Lab.
THERMAL VACUUM LIFE TEST OF A DORNIER MEDIUM SPEED DESPIN MECHANISM (FIRST 2 YEARS OF OPERATION)
J. Gillies and K. Parker Paris ESA Aug. 1978 70 p
(Contract ESTEC-2584)
(ESA-ESTL-1; ESA-CR(P)-1124) Avail: NTIS HC A04/MF A01

A despin mechanism is undergoing a thermal vacuum life test. The shaft of the mechanism is rotating at 60 revolutions a minute and on a monthly basis is subjected to changes of temperature from +45 C to -5 C. The radiation shields surrounding the mechanisms are held at a constant temperature of 22 C. At six monthly intervals tests simulating two different temperatures during satellite eclipse in the earth's shadow are carried out. Regular measurements are made of motor voltage, motor current, power slip ring voltage drop and temperature throughout the mechanism. During the first two years of testing, operation was within specification. G.Y.

N79-16274# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
STUDY OF A MOVABLE, THERMALLY CONDUCTING JOINT FOR APPLICATION TO DEPLOYABLE RADIATORS Final Report
B. Hinderer Paris ESA Jun. 1978 145 p
(Contract ESTEC-3314/77-NL-PP(SC))
(ESA-CR(P)-1127) Avail: NTIS HC A07/MF A01

The development of a thermal joint concept for radial heat transfer from a fixed feeder, which may be part of a cooling loop or a heat pipe, to a deployable radiator, with a good thermal efficiency is described. Several imaginable techniques were subjected to a thermal analysis and examined with regard to the mechanical requirements. The comparison of the results shows, that the most promising solution, having a very small ring gap filled with a mixture of 50% nonsilicon grease and 50% silver powder between the feeder and the rotor profile, is preferable. The most decisive parameters for the selection of the concept and the results of thermal calculation are reported, as well as design drawings of the technological model. A thermal-vacuum test was performed to prove the performance of the concept. G.Y.

N79-16275# Marconi Space and Defence Systems Ltd., Camberley (England).
RESEARCH PROGRAMME INTO THE LUBRICATION OF BEARINGS AND SLIP-RINGS IN VACUUM Final Report
K. R. Dalley and M. G. Warwick Paris ESA Jul. 1978 96 p refs
(Contracts ESTEC-763/69; ESTEC-1852/73)
(Rept-T(F)S/161; ESA-CR(P)-1128) Avail: NTIS HC A05/MF A01

Bearings intended for despin mechanism applications were evaluated with dry (lead film) and liquid lubrication systems which successfully completed 53766 hours and 51371 hours respectively. Slower speed solar array drive bearings were tested under dry lubrication conditions only. The test programme also included the evaluation of titanium carbide coated bearings at 3000 rpm and the study of the load capacity of lead lubricated bearings under vibration conditions. Tests conducted upon various high and low-power slip-rings at design speeds were concluded with a 2 1/2 year vacuum life-test of a dry lubricated combination of silver rings and MoS2 composite brushes. Upon completion of their respective vacuum life-tests, the systems were subjected to detailed examinations and each test programme is concluded with a summary of the resulting examination. G.Y.

N79-16276# British Aerospace Dynamics Group, Bristol (England). Electronic and Space Systems.
FINALISATION OF DEVELOPMENT OF A HYDRAZINE DIAPHRAGM TANK
I. M. Gibbon Paris ESA May 1978 182 p refs
(Contract ESTEC-2745/76)
(ESS/SS-881; ESA-CR(P)-1129) Avail: NTIS HC A09/MF A01

The detail design, manufacture and test of a spacecraft positive expulsion propellant tank are described. All tests were completely successful and the tank satisfies the specifications to which it was designed. The quality assurance procedures adopted throughout the program are also described. G.Y.

N79-16277# National Technical Information Service, Springfield, Va.
OIL WATER SEPARATORS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Dec. 1978
Mona F. Smith Dec. 1978 154 p Supersedes NTIS/PS-78/1004; NTIS/PS-76/0863; NTIS/PS-75/710 3 Vol.
(NTIS/PS-78/1256/3; NTIS/PS-78/1004; NTIS/PS-76/0863; NTIS/PS-75/710) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

The citations cover Federally-sponsored research on devices, primarily for oil pollution control. Centrifuge separators, coalescers, filters, and skimmers are included. Oil recovery from oil spills, and separation from ballast and bilge water are also cited. The operation, testing, and performance of this equipment in the laboratory and in the field are reported. This updated bibliography contains 146 abstracts, 6 of which are new entries to the previous edition. GRA

N79-16278# National Technical Information Service, Springfield, Va.
OIL WATER SEPARATOR. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970-1978
Mona F. Smith Dec. 1978 134 p 3 Vol.
(NTIS/PS-78/1257/1) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Worldwide journal research is cited on water pollution control devices. A range of equipment is described, including gravity separators, centrifuges, membranes, coalescers, filters, distillation columns, and flotation units. Oil recovery from oil spills is covered. Separation of these components in ballast and bilge water, factory effluents, petroleum refineries, and waste oil treatment is studied. Design, operation, costs, testing, and efficiency of these articles are reported. This bibliography contains 128 abstracts. GRA

N79-16279# National Technical Information Service, Springfield, Va.

OIL WATER SEPARATORS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Progress Report, 1973 - Aug. 1978
Mona F. Smith Dec. 1978 145 p 3 Vol.
(NTIS/PS-78/1258/9) Avail: NTIS HC $28.00/MF $28.00 CSCL 13B

Citations cover research on those devices primarily for oil pollution control. Equipment studied includes coalescers, filters, skimmers, scrubbers, absorbers, centrifuges, and sweeps. Oil recovery from oil spills, separation from bilge and ballast water, and removal from petroleum refinery effluents are described. The operation, testing, and performance of this equipment in the laboratory and in the field are reported. This bibliography contains 140 abstracts. GRA

N79-16280# National Technical Information Service, Springfield, Va.
GAS BEARINGS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1971 - Nov. 1978
Guy E. Habercom, Jr. Dec. 1978 270 p Supersedes NTIS/PS-77/1122; NTIS/PS-76/0970; NTIS/PS-75/808; NTIS/PS-75/243
(NTIS/PS-78/1277/9; NTIS/PS-77/1122; NTIS/PS-76/0970; NTIS/PS-75/808; NTIS/PS-75/243) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

Government-sponsored research reports relating to the design, performance and use of gas bearings are cited. This updated bibliography contains 263 abstracts, of which 16 are new to the previous edition. GRA

N79-16281# National Technical Information Service, Springfield, Va.
GAS BEARINGS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978
Guy E. Habercom, Jr. Dec. 1978 299 p Supersedes NTIS/PS-77/1123; NTIS/PS-76/0971
(NTIS/PS-78/1278/7; NTIS/PS-77/1123; NTIS/PS-76/0971) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

The design, performance, and applications of gas bearings are investigated in these reports gathered in a worldwide literature survey. Gas bearing configuration, gas flow, lubrication, bearing load, and bearing stability are among the parameters reviewed. This updated bibliography contains 293 abstracts, 21 of which are new entries to the previous edition. GRA

N79-16282# National Technical Information Service, Springfield, Va.
SEALS AND GASKETS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1976 - Nov. 1978
William E. Reed Dec. 1978 147 p Supersedes NTIS/PS-77/1093; NTIS/PS-76/0938; NTIS/PS-75/838; NTIS/PS-75/140 (NTIS/PS-78/1251/4; NTIS/PS-77/1093; NTIS/PS-76/0938; NTIS/PS-75/838; NTIS/PS-75/140) Avail: NTIS HC $28.00/MF $28.00 CSCL 11A

The citations cover both gas and liquid seals. Studies include polymers, physical properties, glass metal seals, configurations, test methods, and design. Applications involve such areas as gas turbines, water pumps, shaft seals, spacecraft seals, and other specialized seals and gaskets. Highway joint seals are excluded. This bibliography contains 139 abstracts, 49 of which are new entries to the previous edition. GRA

N79-16283# National Technical Information Service, Springfield, Va.
LIQUID BEARINGS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Nov. 1978
Guy E. Habercom, Jr. Dec. 1978 141 p Supersedes NTIS/PS-77/1125; NTIS/PS-76/0973
(NTIS/PS-78/1282/9; NTIS/PS-77/1125; NTIS/PS-76/0973) Avail: NTIS HC $28.00/MF $28.00 CSCL 13I

Design and performance of hydrostatic and hydrodynamic bearings were investigated. Wear resistance, lubrication effectiveness, and performance in cryogenic and liquid metal environments are among the parameters reviewed. This updated bibliography contains 134 abstracts, 6 of which are new entries to the previous edition. GRA

N79-16284# Southwest Research Inst., San Antonio, Tex.
PASSENGER VEHICLE TIRE INSPECTION EQUIPMENT DEVELOPMENT, VOLUME 1 Final Summary Report, Dec. 1974 - Oct. 1977
James E. Johnson, Steven B. Hugg, Edgar C. Schroeder, and Richard E. Thomas Mar. 1978 25 p refs
(Contract DOT-HS-5-01066)
(PB-287143/2; DOT-HS-803-578-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 13F

Nondestructive tire testing techniques were developed and the resultant technology enhancement was incorporated into a prototype machine capable of performing on vehicle tests of passenger vehicle tires with respect to three parameters; carcass integrity, inflation pressure, and tread depth. Carcass integrity determinations are made by exciting the tire with a random forcing function (bandwidth 100-400 hz) and measuring the sidewall response as the tire rotates between displacement transducers. A temperature and pressure compensating inflation pressure control device was developed. The device consists of an instrumented chuck and a control system capable of calculating the equivalent tire pressure at 72F, comparing it to a preset value, and adjusting the tire pressure as necessary to the set cold pressure point. A passover tread depth device was produced. The device is basically a feeler gage, with 400 probes over a 10-inch distance which extended to engage the tire as it passes over the head plate. The travel of the probe results in a change in capacitance, and a processsing circuit calculates a tread profile for each tire. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-16285 Nebraska Univ. - Lincoln.
ASSESSING SYSTEM AVAILABILITY USING THE GRAPHICAL EVALUATION AND REVIEW TECHNIQUE SIMULATION Ph.D. Thesis
Joseph Leon Sessum 1978 285 p
Avail: Univ. Microfilms Order No. 7900354

Methods of calculating and evaluating various quantitative effectiveness measures are explained. Specific emphasis is given to existing network modeling techniques. It was found that GERT, the graphical evaluation and review technique, and especially the simulation approach, GERTS, offers the greatest flexibility and utility for assessing and predicting the effectiveness measures. A tutorial approach is presented for the formulation and analysis of both stochastic (probabilistic) and deterministic system models. Single component system models and multiple component models for series, parallel, and complex system configurations are developed. The initial models rely on a predefined (a priori) maintainability parameter (mean time to repair), for the assessment of availability. A methodology for the assessment of a realistic maintainability parameter using GERTS is presented. Dissert. Abstr.

N79-16286 Cornell Univ., Ithaca, N. Y.
AN APPLICATION OF WEAK CONVERGENCE THEORY TO THE STUDY OF THE STOCHASTIC FAILURES IN PARALLEL MECHANICAL SYSTEMS Ph.D. Thesis
Floyd Wayne Spencer 1978 107 p
Avail: Univ. Microfilms Order No. 7902368

Application of the result to finding the asymptotic limit of the time of system failure of a model allowing catastrophic failure to occur when a random number of elements have failed is given. The application of the results as a possible model of acoustic emission processes is discussed. Dissert. Abstr.

N79-16287 Southern Methodist Univ., Dallas, Tex.
MTBF CONFIDENCE SETS AND ROBUSTNESS PROPERTIES FOR SEQUENTIAL TEST PLANS OF THE MIL-STD-781 Ph.D. Thesis
Stephen Lee Meeks 1978 59 p
Avail: Univ. Microfilms Order No. 7901707

For the purpose of deriving confidence sets for the mean time between failures conditional on the successful completion of a reliability qualification test, the probability generating function for the number of failures conditional on acceptance in the qualification test is derived. The distribution of the number of failures is obtainable by inversion of the generating function. To study the consequences of using the standard on data which does not follow the exponential distribution, three approximations to the operating characteristic function are investigated. The Wald approximation is used to approximate the operating characteristic function under gamma distribution alternatives to the exponential, but the defining equation for the Wald approximation is given in sufficiently general terms to suggest other studies.
Dissert. Abstr.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-16288 Virginia Univ., Charlottesville.
ASTROMETRIC STUDIES WITH A PHOTOELECTRIC AREA SCANNER Ph.D. Thesis
Thomas Earl Strikwerda 1977 96 p
Avail: Univ. Microfilms Order No. 7901165

The rotating photoelectric area scanner is an instrument designed to obtain precise relative star positions over a small diameter telescope field. This instrument, the Astrometric Multiplexing Area Scanner (AMAS), employs a rotating Ronchi ruling in the telescope focal plane to modulate the incoming star light. The resulting signal is analyzed to yield the positions and intensities of the stars in the field. The objectives of this study were to design a second version of the AMAS, in an attempt to obtain a higher precision than the prototype over a larger field. In addition, the AMAS was tested for ability to observe a large number of stars and for ability to provide precise positions. The AMAS was tested by observing several open star clusters. The results show that at least ten stars can be observed simultaneously. Dissert. Abstr.

N79-16289 Cornell Univ., Ithaca, N. Y.
RADIO RECOMBINATION LINES FROM H II REGIONS Ph.D. Thesis
Peter Robert Silverglate 1978 124 p
Avail: Univ. Microfilms Order No. 7902367

Radio recombination lines from forty-six H 2 regions were observed. Observations were made at 1400 MHz in the frequency switching mode, and at 2372 MHz in the total power mode. Gaussians were fit to the observed lines to derive velocities, line width, and line temperatures. From the velocities kinematic distances were derived. For eleven sources H 1 absorption measurements were also made. Estimates of emission measures, electron temperatures, and electron densities were derived using a non-LTE analysis. Estimates of electron densities and temperatures in C 2 regions were also derived. The unusual double recombination line source, G37.7 + 0.1, is discussed. From the results it was estimated the supernova rate to be 1/200 years and early O type star lifetimes to be approximately 1,000,000 years. Dissert. Abstr.

N79-16290 City Univ. of New York.
NON-LINEAR DEFORMATION OF THIN, SHALLOW, SPHERICAL SHELLS Ph.D. Thesis
Maria Cristina Sinay 1978 107 p
Avail: Univ. Microfilms Order No. 7900809

A theoretical and numerical analysis of large axisymmetric deflections and stresses of a thin, shallow spherical shell is presented. The shell is considered as an initially clamped, flat, circular plate which has suffered a deformation. In considering large deflection bendings, analysis led to a system of two coupled differential equations, each one of them an inhomogeneous form of a Bessel equation. An approximate solution of the system is represented as a finite sum of n eigenfunctions of the Bessel operator. This yields a nonlinear algebraic system of coupled equations which is solved numerically. The numerical results are used to calculate the deflection of the shell as well as bending and membrane stresses. Dissert. Abstr.

N79-16291 Indiana Univ., Bloomington.
UNIQUENESS THEOREMS IN LINEAR ELASTOSTATICS FOR UNBOUNDED BODIES Ph.D. Thesis
Kenneth Bruce Howell 1978 130 p
Avail: Univ. Microfilms Order No. 7900394

The uniqueness of solutions to linear elastostatic boundary value problems on unbounded two and three-dimensional bodies is investigated, and extensions of several of the major bounded body uniqueness theorems are obtained for corresponding problems on unbounded bodies. The special case of boundary value problems whose solutions satisfy periodicity requirements is also considered. Here, some general properties of these solutions are derived, and uniqueness results are proven for these problems. Dissert. Abstr.

N79-16292 Cornell Univ., Ithaca, N. Y.
FURTHER EXAMINATION AND A LOCAL LOAD-SHARING EXTENSION OF COLEMAN'S TIME TO FAILURE MODEL FOR FIBER BUNDLES Ph.D. Thesis
Robert Kelley 1978 102 p
Avail: Univ. Microfilms Order No. 7902277

Under Coleman's model, the failure time has an asymptotic normal distribution as the bundle size grows, but convergence is shown to be slow. Under the local rule, convergence is numerically shown to be very fast, toward a nonnormal distribution. Since the asymptotic form of the mean and variance is unknown, another form of convergence is also studied. Convergence in distribution is proven for the equal load-sharing rule, but is shown to be slow. Under the local rule, convergence is shown numerically to be very rapid, which suggests that large bundle distributions can be approximated through the use of small bundle results. Dissert. Abstr.

N79-16293 Michigan State Univ., East Lansing.
ON THE PROBLEM OF A PLANE, FINITE LINEAR-ELASTIC REGION CONTAINING A HOLE OF ARBITRARY SHAPE: A BOUNDARY INTEGRAL APPROACH Ph.D. Thesis
Ali Reza Seyed MirMohamadSadegh 1978 272 p
Avail: Univ. Microfilms Order No. 7900727

Previous boundary integral equation methods were developed for problems of two-dimensional elastostatics which yield excellent results everywhere except near the boundary. This presents a major disadvantage for problems in which a hole, slot or sharp crack is present. A formulation of the boundary integral method is presented which eliminates this inaccuracy on and near the opening. This is done by replacing the kernel of the integrand (the influence function) with one which includes the effect of the opening. Potential functions are found for the cases of a circular hole, an elliptical hole and a sharp crack. The determination of these functions for other opening shapes is also discussed. The boundary integral equation method is applied to some finite regions containing either a circular hole, an elliptical hole, or a sharp crack. Dissert. Abstr.

N79-16294 Michigan State Univ., East Lansing.
TWO-DIMENSIONAL AND THREE-DIMENSIONAL LINEAR ELASTICITY SOLUTIONS BY EIGENFUNCTION EXPANSIONS AND THE BOUNDARY INTEGRAL EQUATION METHOD Ph.D. Thesis
Jing Chang 1978 155 p
Avail: Univ. Microfilms Order No. 7900680

Two numerical solutions were developed for problems in two-dimensional and three-dimensional elastostatics. The eigenfunction expansion method was based on the general solution of the Navier equations in polar coordinates and spherical coordinates and used functions which are non-orthogonal on the boundary. Numerical techniques of point matching or least-squares were used to satisfy the boundary conditions. The boundary integral equation method utilized singular integral equations which were solved numerically for the unknown surface tractions and displacements for the fully mixed boundary value problems. A fictitous traction applied on the boundary is used in the boundary integral equation methods. Both methods are

independent of the boundary shape and the boundary conditions. Dissert. Abstr.

N79-16295 Pennsylvania Univ., Philadelphia.
STRESS ANALYSIS OF FINITE PLATES ADHESIVELY BONDED TO A HALF-SPACE: APPLICATIONS TO ORTHODONTIC DIRECT BONDING Ph.D. Thesis
Lawrence Michael Connelly 1978 207 p
Avail: Univ. Microfilms Order No. 7824708

Both the bracket and the adhesive layer are modeled as thin plates. A theory which accounts for transverse normal stresses is used to examine the stress state arising in the bracket and adhesive layer for various normal and shear loadings applied to the top of the bracket. Stresses arising due to temperatures varying in the transverse direction are also considered. Most adhesives have material properties which exhibit time dependent behavior to some degree; hence, a viscoelastic analysis is carried out in which the adhesive is considered to have time-varying material properties. Results indicate that in an assembly under the action of a uniform shear load, all stresses decrease as the total thickness of the assembly decreases. Increasing the adhesive to plate thickness ratio decreases all the stresses in the structure, with the exception of the in-plane normal stress of the plate and the transverse shear stress of the adhesive in the direction of the shear traction. Dissert. Abstr.

N79-16296 Texas Univ. at Austin.
A GENERALIZED SOLUTION FOR TIME-DEPENDENT RESPONSE AND STRENGTH OF NONCOMPOSITE AND COMPOSITE PRESTRESSED CONCRETE BEAMS Ph.D. Thesis
Chaichan Suttikan 1978 421 p
Avail: Univ. Microfilms Order No. 7900642

A computer program is developed for the analysis of initial and time-dependent responses and strength in simple bending of partially or fully prestressed concrete members. The program is capable of analyzing members of any cross-sectional shape having one axis of symmetry, noncomposite or composite, subjected to various sequences of loading and construction. It accounts for the effects of nonlinearity of stress-strain responses of materials, variations with time of strength, creep, and shrinkage of concrete, and relaxation of bonded prestressing steel in different parts of cross-sections. The nonlinearity of rotational and translational supports can also be accounted for in the analysis. A step-by-step method divides the time interval of interest into several smaller time increments in which the responses are determined as if they are independent of time as part of the time-dependent response analysis. Dissert. Abstr.

N79-16297 Rutgers - The State Univ., New Brunswick, N. J.
TORSIONAL APPARATUS FOR THE MEASUREMENT OF MODULUS OF RIGIDITY Ph.D. Thesis
Herbert Karl Wiese, Jr. 1978 153 p
Avail: Univ. Microfilms Order No. 7901323

A torsional apparatus is described that enables the measurement of elastic properties from the unfired to the fired stages of a wide range of ceramic bodies. Modulus of rigidity of 96% pure Cr2O3 bodies and a porcelain body were allowed through the firing process. Definite differences were exhibited in changes in modulus of rigidity between green samples of the Cr2O3 bodies that were both dried and undried before firing. Undried green samples, although less rigid from room temperature to 200 C, showed a remarkably rapid increase in rigidity to 1000 C which was approximately 35% greater than the dried Cr2O3 samples. An activation energy of 109,907 cal/mole was obtained between 1100 C and 1300 C, and 40,772 cal/mole between 1300 C and 1600 C. The apparatus was capable of closely following similar changes in rigidity of the more complicated porcelain body with equal reproducibility. Dissert. Abstr.

N79-16298 Missouri Univ. -Rolla.
WEB CRIPPLING STRENGTH AND A COMBINATION OF BENDING AND WEB CRIPPLING OF COLD-FORMED STEEL BEAMS Ph.D. Thesis
Nipon Hetrakul 1978 239 p
Avail: Univ. Microfilms Order No. 7822374

The testing of 140 built-up beams having single unreinforced Webs and 152 I-beams having double webs is reported. In addition, 66 beam tests were conducted for the case of combined bending moment, shear and web crippling. The experimental results obtained from the beam tests were carefully evaluated for various loading conditions. Consequently, design formulas were derived on the basis of the available test data by using a regression analysis. These equations can be used to predict the web crippling loads of cold-formed steel beams when they are subjected to concentrated loads and/or reactions. The interaction formulas derived from this study reflect the influence of bending moment on the web strength against crippling. Dissert. Abstr.

N79-16299# National Mechanical Engineering Research Inst., Pretoria (South Africa). Strength Mechanics Div.
PROGRAM HOLZER: COMPUTER PROGRAM TO DETERMINE THE NATURAL FREQUENCIES OF A MULTIMASS TORSIONAL VIBRATION SYSTEM
M. J. Dawson and H. G. Denkhaus Mar. 1978 37 p refs
(CSIR-ME-1559; ISBN-0-7988-1325-3) Avail: NTIS HC A03/MF A01

This report describes a computer program that determines the natural frequencies of a multimass torsional vibration system. A brief introduction to torsional vibrations is included. G.G.

N79-16300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL EVALUATION OF THE EFFECT OF INLET DISTORTION ON COMPRESSOR BLADE VIBRATIONS
J. F. Lubomski 1979 17 p refs Presented at the Intern. Gas Turbine Conf., San Diego, Calif., 12-15 Mar. 1979; sponsored by Am. Soc. of Mechanical Engineers.
(NASA-TM-79066; E-9882) Avail: NTIS HC A02/MF A01 CSCL 20K

Compressor rotor strain gage data from an engine test conducted with an inlet screen distortion were reduced and analyzed. These data are compared to data obtained from the same engine without inlet pressure distortion to determine the net effect of the distortion on the vibratory response of the compressor blades. The results obtained are presented. Author

N79-16301*# General Electric Co., Philadelphia, Pa.
A PROCEDURE OBTAINING STIFFNESSES AND MASSES OF A STRUCTURE FROM VIBRATION MODES AND SUBSTRUCTURE STATIC TEST DATA
Harold H. Edighoffer Jan. 1979 59 p
(Contract NAS1-15294)
(NASA-CR-158984) Avail: NTIS HC A04/MF A01 CSCL 20K

A component mode desynthesis procedure is developed for determining the unknown vibration characteristics of a structural component (i.e., a launch vehicle) given the vibration characteristics of a structural system composed of that component combined with a known one (i.e., a payload). At least one component static test has to be performed. These data are used in conjunction with the system measured frequencies and mode shapes to obtain the vibration characteristics of each component. The flight dynamics of an empty launch vehicle can be determined from measurements made on a vehicle/payload combination in conjunction with a static test on the payload. G.G.

N79-16302# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
FATIGUE CRACK GROWTH IN LUGS AND THE STRESS INTENSITY FACTOR
J. Schijve and A. H. W. Hoeymakers Jul. 1978 29 p refs
(LR-273; ICAF-1061) Avail: NTIS HC A03/MF A01

Crack growth in aluminum alloy lugs was recorded during constant-amplitude loading (R = 1/3). Observations were made both for artificial cracks started by a small saw cut and natural cracks started by fretting corrosion between hole and pin. Scatter was low for artificial cracks, whereas considerable scatter applied to the natural cracks as a result of multiple crack initiation at different times and locations. The fastest crack growth was observed for artificial cracks, which appear to be a worst case as compared to natural cracks. K-values derived from crack growth were in good agreement with K-values proposed in the literature. Author

N79-16303*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. School of Engineering Science Mechanics.

ELASTIC-PLASTIC FINITE ELEMENT ANALYSES OF FATIGUE CRACK GROWTH IN MODE 1 AND MODE 2 CONDITIONS Final Scientific Report

Michihiko Nakagaki and Satya N. Atluri Nov. 1978 83 p refs (Grant NsG-1351)

(NASA-CR-158987) Avail: NTIS HC A05/MF A01 CSCL 20K

One of the objectives of the report is to present an alternate cost efficient and accurate elastic-plastic finite element procedure to analyse fatigue crack closure and its effects under general spectrum loading. Both Modes 1 and 2 type cycling loadings are considered. Also presented are the results of an investigation, using the newly developed procedure, of various factors that cause crack growth acceleration or retardation and delay effects under high-to-low, low-to-high, single overload, and constant amplitude type cyclic loading in a Mode 1 situation. Further, the results of an investigation of a center-cracked panel under external pure shear (Mode 2) cyclic loading, of constant amplitude, are reported. G.Y.

N79-16304# Bari Univ. (Italy). Ist. di Macchine.

ELEMENTS FOR DESIGNING OLEODYNAMIC CYLINDERS ON THEORETICAL AND EXPERIMENTAL STUDIES [L'ANALISI DELLE SOLLECITAZIONI NEI PROBLEMI DELLA ENERGIA E DELLA ECONOMIA DELLA PRODUZIONE]

Tommaso Contursi, Luigi Mangialardi, and Giuseppe Monno 1977 14 p refs In ITALIAN; ENGLISH summary Presented at the 5th Natl. Congr. of the Assoc. Ital. per L'Anal. delle Sollecitazioni, Bari, Italy, 29 Sep.-1 Oct. 1977

(Contract CNR-75.01117.07)

Avail: NTIS HC A02/MF A01

A theoretical-experimental study on a double-acting oleodynamic cylinder is described. Stress distribution in the r.bottom-tube weld and at the f.bottom-tube joint was investigated using the finite elements method and the strain gage technique. The influence of this joint's geometry on stress distribution was then investigated in order to give useful indications to designers.

Author (ESA)

N79-16305# Bari Univ. (Italy). Ist. di Macchine.

ELASTIC STRESS CONCENTRATION OF AN AXIALLY LOADED CRUCIFORM JOINT [FATTORE DI INTAGLIO IN CAMPO ELASTICO PER GIUNTI A CROCE SOLLECITATI ASSIALMENTE]

Bruno Atzori and Vito Dattoma 1977 15 p refs In ITALIAN; ENGLISH summary Presented at the 5th Natl. Congr. of the Assoc. Ital. per l'Anal. delle Sollecitazioni, Bari, Italy 29 Sep. - 1 Oct. 1977

Avail: NTIS HC A02/MF A01

The influence of the geometry on the elastic stress concentration factor K sub t of a cruciform welded joint axially loaded was investigated. Complete penetration was assumed for the analysis and the state of stress at the surface of the main plate was considered. The analysis was performed using finite element techniques, with an isoparametric quadrangular element. The computations were carried out on an IBM 370-158. Results obtained are compared with those available in the literature for some particular geometries. Author (ESA)

N79-16306# European Space Research and Technology Center, Noordwijk (Netherlands).

THE RESISTANCE OF SPACE-QUALITY SOLDER JOINTS TO THERMAL FATIGUE

B. D. Dunn Paris ESA Sep. 1978 53 p refs

(ESA-STM-207) Avail: NTIS HC A04/MF A01

An evaluation program involving the extensive thermal cycling of component-assembled printed circuit boards was undertaken to assess the suitability of ESA-approved hand-soldering techniques for use on long-life satellites. The modes of joint degradation are discussed and the metallurgical changes that result from material thermal expansion mismatch and repeated strain within the solder alloy (63 percent tin, 37 percent lead) are highlighted by photomicroscopy. L.S.

N79-16307# Admiralty Underwater Weapons Establishment, Portland (England).

PAFEC 75 ON THE AUWE ICL 1904S*. A USERS' GUIDE

W. J. Butterworth Apr. 1978 59 p refs

(AUWE-Publ-45685; BR63452) Avail: NTIS HC A04/MF A01

PAFEC75 is the lastest development in the PAFEC (Program for Automatic Finite Element Calculations) suite which carries out stress or thermal analysis on any structure by means of finite element methods. A guide to the method used on the 1904S* computer is given. G.Y.

N79-16308# Naval Construction Research Establishment, Dunfermline (Scotland).

ELASTIC PLATE BUCKLING USING FINITE ELEMENTS

G. C. Mitchell Feb. 1976 29 p refs

(NCRE/R627; BR51061) Avail: NTIS HC A03/MF A01

Von Karman's large-deflection theory for elastic plates is used to define the stability criterion in terms of stored strain energy. The analytic expressions are then approximated using a mesh of 9 degree-of-freedom triangular finite elements of the type first proposed by Zienkiewicz. Finally, the use of a computer program, based on the preceding theory, is described, and results from solution convergence studies are presented. Author

N79-16309# Royal Aircraft Establishment, Farnborough (England).

STUDY OF DEFORMATION IN A METAL BAR DUE TO SHOCKWAVE PROPAGATION

M. P. Wright Aug. 1977 15 p refs

(RAE-TR-77131; BR62227) Avail: NTIS HC A02/MF A01

An attempt was made at establishing the displacement-time profiles of points on the side and end of a long metal bar when a compression wave travels along its length. The part of the bar to be examined is polished optically flat and is used as one reflector in a conventional two-beam interferometer. The passage of the wave distorts the polished area. The resultant transient fringe pattern representing the distortion in the out-of-plane direction is recorded by high-speed streak photography. From the records, graphs of displacement against time can very easily be derived with high resolution. G.Y.

N79-16310# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

SIMPLIFIED THREE-DIMENSIONAL ANALYSIS AND DESIGN OF FIBRE REINFORCED ANNULAR DISCS SURROUNDING A CIRCULAR HOLE IN A FLAT PLATE UNDER VARIOUS LOADING CONDITIONS

E. H. Mansfield London Aeron. Res. Council 1978 38 p refs Supersedes RAE-TR-76148; ARC-37224

(ARC-R/M-3815; BR63622; RAE-TR-76148; ARC-37224)

Avail: NTIS HC A03/MF A01; HMSO £4;PHI

A flat plate containing a circular hole is subjected to arbitrary bi-axial stresses at infinity; adjacent to the hole and bonded symmetrically to both sides of the plate are cylindrically wound fiber composite annular discs. The relatively low shear moduli of the composite cause shear lag effects normal to the plane of the plate. It is shown that it is possible to allow for these effects, within the framework of a two-dimensional analysis, by the use of an effective thickness for the reinforcement which is a function of the overall geometry, the elastic moduli and the type of loading. The practially important case of applied uniaxial stress is considered in detail and it is shown how, for a given weight of reinforcement, the reinforcement cross-section can be chosen to minimize the peak stresses. L.S.

N79-16311# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

FATIGUE ACCELERATION IN BOX BEAMS UNDER MECHANICAL AND THERMAL STRESS (SECOND SERIES)

F. E. Keates, F. E. Kiddle, R. F. Mousley, and D. Gunn London Aeron. Res. Council 1978 67 p refs Supersedes RAE-TR-76096; ARC-37369

(ARC-R/M-3817; BR64191; RAE-TR-76096; ARC-37369)

Avail: NTIS HC A04/MF A01; HMSO £ 6; PHI

To assist the development and interpretation of the Concorde Major Fatigue Test a technique for accelerating fatigue testing

was evaluated on structural box specimens under combined mechanical and thermal loadings. It is shown that for a moderate level of thermal fatigue the acceleration achieved was in reasonably good agreement with prediction but that at a high level of thermal fatigue the acceleration was appreciably higher than predicted. A tendency was observed for acceleration to be higher in crack propagation than in crack initiation. G.Y.

N79-16312# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

PREDICTION OF CRACK GROWTH IN DAMAGE-TOLERANT DESIGN: A BASIC PARAMETRIC STUDY

Vera J. Pike and W. T. Kirkby London Aeron. Res. Council 1978 39 p refs Supersedes RAE-TR-77026; ARC-37438 (ARC-R/M-3822; BR64189; RAE-TR-77026; ARC-37438) Avail: NTIS HC A03/MF A01; HMSO £ 4; PHI

A study was undertaken to obtain some experience of the difficulties likely to arise in predicting crack behaviour when implementating the damage-tolerant design philosophy and to obtain an indication of the influence of some of the design parameters involved on life to failure. The study was centered on the growth of a corner-crack from a hole in an infinite plate, remotely loaded. The parameters considered included hole diameters, initial crack length and the severity of the spectrum of applied loads. Predictions of life were made for five different aluminum alloys. The study highlighted difficulties associated both with the analytical method and with shortcomings in available materials data. G.Y.

N79-16313# Centre National d'Etudes Spatiales, Toulouse (France).

EFFECTIVE MASS, AN IMPORTANT CONCEPT FOR THE DYNAMIC CHARACTERIZATION OF STRUCTURES IN CASE OF BASE EXCITATION. THEORY AND APPLICATIONS [LA MASSE EFFECTIVE, UN CONCEPT IMPORTANT POUR LA CARACTERISATION DYNAMIQUE DES STRUCTURES AVEC EXCITATION DE LA BASE - THEORIE ET APPLICATIONS]

Jean-Francois Imbert and Amin Mamode Aug. 1978 41 p refs In FRENCH; ENGLISH summary (CNES-NT-83) Avail: NTIS HC A03/MF A01

A method based on the effective mass concept, for the dynamic characterization of structures in case of base excitation is described. A complete theoretical formulation including effective mass properties and modal truncation effects is presented. Typical applications which illustrate the practical advantages of this method for solving dynamic problems of space vehicles are given. G.Y.

N79-16314# Terra Tek, Inc., Salt Lake City, Utah.

COMPLIANCE CALIBRATION OF THE SHORT ROD FRACTURE TOUGHNESS SPECIMEN

L. M. Barker Apr. 1978 25 p (PB-287009/5; TR-78-20; NSF/RA-780082) HC A02/MF A01 CSCL 14B

A laser interferometer measurement of the compliance versus the crack length curve for the short rod fracture toughness specimen is reported. The measured data are used to calculate the constant which relates the peak load in a short rod test to the fracture toughness. The compliance measurement technique is described and the results are presented. The compliance data produced a calibration constant, A, which is significantly higher than the calibration constant derived from previous comparison tests. Analysis of the difference between the A calibrations led to a detailed comparison of the ASTM K sub I sub c and the short rod Klc measurements. An examination of the reasons for this difference, the relationship between the fracture toughness as measured by ASTM Standards and by the short rod method was clarified, explaining part of the discrepancy. GRA

N79-16315# Terra Tek, Inc., Salt Lake City, Utah.

SHORT BAR SPECIMENS FOR K(Ic) MEASUREMENTS

L. M. Barker Feb. 1978 23 p Presented at the 11th Natl. ASTM Symp. on Fracture Mech., Va. Polytechnic Inst. and State Univ., Blacksburg, Va., 12-14 Jun. 1978 (PB-287010/3; TR-78-8; NSF/RA-780081) Avail: NTIS HC A02/MF A01 CSCL 14B

The new short rod fracture toughness specimen with a circular cross section was successfully used for (K sub Ic) measurements on a wide variety of materials, including brittle nonmetals. A rectangular shaped short bar specimen, which is comparable in every respect to the short rod, was developed and tested. This paper briefly reviews the short rod/short bar test methods, and then presents the short bar design considerations which give it the same characteristics as the short rod. The results of carefully controlled tests showed that the short bar calibration constant can be considered the same as that of the short rod. The short bar dimensions were selected so that the geometrical constant relating (K sub Ic) to the peak load in an experiment should be the same for both short rod and short bar configurations, according to simplified compliance calculation. Comparison testing of short rod and short bar specimens of aluminum oxide, and fused quartz showed no experimentally significant difference in the geometrical constant. GRA

N79-16316# Terra Tek, Inc., Salt Lake City, Utah.

THEORY FOR DETERMINING K(Ic) FROM SMALL, NON-LEFM SPECIMENS, SUPPORTED BY EXPERIMENTS ON ALUMINUM

L. M. Barker Feb. 1978 34 p refs Sponsored by NSF Submitted for publication (PB-287085/5; TR-78-6; NSF/RA-780080) Avail: NTIS HC A03/MF A01 CSCL 14B

A rationale is presented for measuring K sub I sub c using much smaller specimens than those required by conventional test methods. Two main points are involved: (1) the use of specimen configurations for which the material along the crack tip is better constrained to the plane-strain state, and (2) the measurement and elastic-plastic analysis of the load displacement curve (including at least two unloading slopes) to determine the energy per unit crack area of the propagating crack. The elastic-plastic analysis produces a very simple result which is easily applied in practice. The rationale is tested by the measurement of K sub I sub c of 6061-T651 aluminum using short rod speciments of four different diameters. The sub I sub c data are found to be independent of the specimen size for diameters as small as 0.9 (K sub I sub c/sigma ys)squared, the smallest tested. The K sub I sub c of this study compares satisfactorily with published data on 6061-T651 aluminum. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N79-16317 Texas A&M Univ., College Station.

ELECTROMAGNETIC PROBING OF SALT WITH HIGH FREQUENCY RADAR Ph.D. Thesis

Paul Julian Tarantolo, Jr. 1978 303 p Avail: Univ. Microfilms Order No. 7901015

The major thrust of this dissertation is the development, field testing, and theoretical evaluation of a high frequency (HF) radar system for use in probing rock salt where very-high frequency (VHF) radars failed. The Alpha 2 radar system is a portable, pulsed HF radar system designed to probe in wet salt. It operates at a frequency of 30 MHz with up to 10 kW of peak output power, a pulse width of 1 micron, and a repetition frequency of 1 kHz. The Alpha 2 radar system was successfully field tested within two salt mines: Grand Saline, Texas (dry salt); and Windsor, Ontario (wet salt). A theoretical study of the radar detectability of boreholes, brine cavities, and flat rectangular discontinuities was made to investigate the effect on detectability of moving

from VHF to HF. In the cases investigated, lowering the radar frequency from VHF to HF improves the radar detectability of a discontinuity. Dissert. Abstr.

N79-16318 Cornell Univ., Ithaca, N. Y.
A LAND EVALUATION METHODOLOGY FOR NATURAL RESOURCE PLANNING IN MOUNTAIN REGIONS IN THE AMERICAN TROPICS: A CASE STUDY OF RIO GUANARE VENEZUELA Ph.D. Thesis
Robert Alan Hawes 1978 197 p
Avail: Univ. Microfilms Order No. 7902328

A land evaluation methodology is developed by collecting an integrating data on landforms, surficial deposits, climate, geology, soil, surface water resources and vegetation. Forty-six land types are described for the study area. A land type is a recurring pattern of landforms with their associated soil and geological materials within an area of relatively homogeneous macroclimate of life zone. Suitability analyses are made for 5 agricultural crop types, coffee, bananas, cassava, citrus and maize, and for grazing, for forestry, including watershed protection, timber harvesting of natural forests and plantation forestry, and for water based recreation use. A scenic inventory was also made of the high quality scenic areas along the major highway corridors. The land type and suitability data provided are used to assess alternative policy and management objectives.
Dissert. Abstr.

N79-16319 California Univ., Los Angeles.
CONSIDERATIONS OF STOCHASTIC PROPERTIES IN PARAMETER ESTIMATION OF HYDROLOGIC RAINFALL-RUNOFF MODELS Ph.D. Thesis
Soroosh Sorooshian 1978 268 p
Avail: Univ. Microfilms Order No. 7901405

In order to reduce the curve fitting effect and instead enhance the automatic model fitting aspects, a stochastic mathematical procedure was developed for the parameter estimation of hydrologic rainfall-runoff models. The maximum likelihood estimation procedure was employed and modified to produce the proper objective functions for handling the two important error situations that arise in rainfall-runoff parameter estimation problems. Procedures were tested with synthetic data for various error configurations on a two-parameter model. A method for the sensitivity analysis of the estimated parameters was developed. This method was then applied to study the resulting shape of the response surface of each of the employed objective functions. It was concluded that with the application of the newly developed procedures it is more likely that the resulting fitted model is a more realistic representation of the underlying physical processes of the watershed behavior. Dissert. Abstr.

N79-16320 Florida Univ., Gainesville.
TSUNAMI INTERACTION WITH COASTLINES AND ELEVATION PREDICTIONS Ph.D. Thesis
James Robert Houston 1978 116 p
Avail: Univ. Microfilms Order No. 7900063

The development is described of two numerical models that accurately simulate the propagation of tsunamis to nearshore regions and the interaction of tsunamis with coastlines. One of these models is a finite element model which uses a telescoping numerical grid to cover a section of the Pacific Ocean, including all eight islands of the Hawaiian Islands. The second model is a finite difference scheme that uses four rectilinear grids to cover most of the west coast of the continental United States. A frequency of occurrence analysis of tsunami elevations at the shoreline in the Hawaiian Islands is described based upon local historical data. A generation and deep-ocean propagation numerical model is used to propagate tsunamis with varying intensities from locations throughout the Aleutian-Alaskan and Peru-Chile regions to a water depth of 500 meters off the west coast. Dissert. Abstr.

N79-16321 West Virginia Univ., Morgantown.
MEASUREMENT AND ANALYSIS OF FLAME AND PLUME MICROWAVE THERMAL RADIATION FOR REMOTE SENSING OF FOREST FIRES Ph.D. Thesis
Ernest Eldon Barth 1978 268 p
Avail: Univ. Microfilms Order No. 7900878

The thermal emission from fire and smoke plumes was measured at 19.35 GHz. Differences were sought between fire/smoke and background antenna temperatures and the AC components of the amplified radiometer output voltages. Fuel beds were rectangular and were generally about 7 m by 2 m. The fuel burned was hay, straw, and old tires. Plumes were scanned azimuthally at 0 deg, 10 deg and 20 deg, elevation angles at a range of about 17 to 28 m. There were no significant differences in the plume data at 10 deg and 20 deg (mean antenna temperature and amplified AC components of radiometer output voltages). Burning fuel at -6 deg elevation yielded antenna temperature differences of about 200 K for burning fuel to background measurements. Estimated equivalent emissivity range for the fuel bed was found to be 0.57 to 0.77. Dissert. Abstr.

N79-16322 Texas A&M Univ., College Station.
INVENTORY OF SURFACE WATER USING LANDSAT Ph.D. Thesis
Gary Eugene Graybeal 1978 130 p
Avail: Univ. Microfilms Order No. 7900974

The study site selected for this investigation covered approximately 132,000 hectares in east-central Texas and contained 100 bodies of surface water that ranged in size from 0.83 hectare to 17.48 hectares. The classification results, using the recommended procedure, contained no areas in the study site which had been identified as water which were actually nonwater. The identification results also showed that 58 percent of the 69 water bodies ranging in size from 0.81 hectare to 2.02 hectares and 33.3 percent of the 15 water bodies ranging in size from 2.03 hectares to 4.04 hectares were misclassified as nonwater. However, the identification results showed that all 16 water bodies 4.05 hectares or greater were correctly identified as water. Dissert. Abstr.

N79-16323*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
DESIGN OF A LOW COST EARTH RESOURCES SYSTEM Final Report
N. L. Faust, M. D. Furman, and G. W. Spann, Principal Investigators (Metrics, Inc.) 31 Aug. 1978 161 p ERTS
(Contract NAS8-32397; GT Proj. A-1938)
(E79-10065; NASA-CR-150838) Avail: NTIS HC A08/MF A01 CSCL 12B

The author has identified the following significant results. Survey results indicated that users of remote sensing data in the Southeastern U.S. were increasingly turning to digital processing techniques. All the states surveyed have had some involvement in projects using digitally processed data. Even those states which do not yet have in-house capabilities for digital processing were extremely interested in and were planning to develop such capabilities.

N79-16324*# Pittsburgh Univ., Pa. Dept. of Earth and Planetary Sciences.
[DATA COLLECTION AND INTERPRETATION OF THE LITHOLOGIC CHARACTERIZATION OF THE CRYSTALLINE BASEMENT PROVINCES OF THE EASTERN UNITED STATES] Semiannual Report, Apr. - Oct. 1978
Edward G. Lidiak, Principal Investigator 1 Nov. 1978 31 p ref ERTS
(Contract NsG-5270)
(E79-10066; NASA-CR-157965) Avail: NTIS HC A03/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N79-16325*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
COMPUTER PROGRAM DOCUMENTATION: ISOCLS ITERATIVE SELF-ORGANIZING CLUSTERING PROGRAM, PROGRAM C094
Ruth T. Minter, Principal Investigator Oct. 1972 150 p refs EREP
(Contract NAS9-12200)
(E79-10093; NASA-CR-151545; CPD-202) Avail: NTIS HC A07/MF A01 CSCL 02C

The author has identified the following significant results. This program implements an algorithm which, ideally, sorts a given set of multivariate data points into similar groups or clusters.

The program is intended for use in the evaluation of multispectral scanner data; however, the algorithm could be used for other data types as well. The user may specify a set of initial estimated cluster means to begin the procedure, or he may begin with the assumption that all the data belongs to one cluster. The procedure is initiatized by assigning each data point to the nearest (in absolute distance) cluster mean. If no initial cluster means were input, all of the data are assigned to cluster 1. The means and standard deviations are calculated for each cluster.

N79-16326*# Servicio Geologico de Bolivia, La Paz.
GEOLOGICAL MAP OF BOLIVIA [MAPA GEOLOGICO DE BOLIVIA]
Jorge ParejaL., Principal Investigator, Carlos VargasF., Ramiro SuarezS., Raul BallonA., Raul CarrascoC., and Carlos VillarroelA. 1978 90 p refs In SPANISH Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS (E79-10094, NASA-CR-157984) Avail: NTIS HC A05/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N79-16327*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES, VOLUME 2 Annual Progress Report
Robert N. Colwell, Ralph Algazi, Leonard W. Bowden, John E. Estes, Ida R. Hoos, and Siamak Khorram, Principal Investigators 1 May 1978 155 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS 2 Vol.
(Grant NGR-05-003-404)
(E79-10097; NASA-CR-158051; SSL-Ser-19-Issue-53-Vol-2)
Avail: NTIS HC A08/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N79-16328*# Auburn Univ., Ala. Dept. of Industrial Engineering and Mechanical Engineering.
IMPLEMENTATION OF ALABAMA RESOURCES INFORMATION SYSTEM, ARIS Final Report, 20 Dec. 1976 - 15 Dec. 1978
B. E. Herring 10 Dec. 1978 56 p
(Contract NAS8-32215)
(NASA-CR-150904; ALA-AU-X996-1004-2;
ALA-ARC-TENN-TOM-77-99) Avail: NTIS HC A04/MF A01 CSCL 08F

Development of ARIS - Alabama Resources Information System is summarized. Development of data bases, system simplification for user access, and making information available to personnel having a need to use ARIS or in the process of developing ARIS type systems are discussed. J.M.S.

N79-16329*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE WORKSHOP
J. L. Heilman, ed. (South Dakota State Univ.), D. G. Moore, ed. (South Dakota State Univ.), T. J. Schmugge, ed., and D. B. Friedman, ed. Nov. 1978 219 p refs Workshop held at Beltsville, Md., 17-19 Jan. 1978; sponsored in part by NASA and the US Dept. of Agriculture
(NASA-CP-2073) Avail: NTIS HC A10/MF A01 CSCL 08M

The Soil Moisture Workshop was held at the United States Department of Agriculture National Agricultural Library in Beltsville, Maryland on January 17-19, 1978. The objectives of the Workshop were to evaluate the state of the art of remote sensing of soil moisture; examine the needs of potential users; and make recommendations concerning the future of soil moisture research and development. To accomplish these objectives, small working groups were organized in advance of the Workshop to prepare position papers. These papers served as the basis for this report. For individual titles, see N79-16330 through N79-16337.

N79-16330*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORMATION OF THE SOIL MOISTURE WORKSHOP
In its Soil Moisture Workshop Nov. 1978 2 p (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

A brief discussion of the need for the formation of the Soil Moisture Workshop and its objectives is presented. G.Y.

N79-16331*# Department of Agriculture, Washington, D.C. Agricultural Research Service.
REMOTE SENSING AS A TOOL IN ASSESSING SOIL MOISTURE
Carl W. Carlson *In* NASA. Goddard Space Flight Center Soil Moisture Workshop Nov. 1978 9 p (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

The effects of soil moisture as it relates to agriculture is briefly discussed. The use of remote sensing to predict scheduling of irrigation, runoff and soil erosion which contributes to the prediction of crop yield is also discussed. G.Y.

N79-16332*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REMOTE SENSING OF SOIL MOISTURE: A NASA VIEWPOINT
L. H. Meredith *In its* Soil Moisture Workshop Nov. 1978 4 p (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

A representative of NASA/Goddard Space Flight Center addressed the Workshop and offered a few points in terms of where NASA might be able to help provide observational and information handling capabilities. The function of NASA is briefly discussed in order to determine how NASA could help in this endeavor. Several questions are posed to the Workshop for consideration. G.Y.

N79-16333*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF SOIL MOISTURE INFORMATION
C. J. Johannsen, E. T. Engman, B. J. Blanchard, O. Bockes, D. Brueck, J. Deardorff, J. L. Heilman, L. Myrup, and M. Keener *In its* Soil Moisture Workshop Nov. 1978 35 p refs (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

The needs of specific users within the areas of agriculture, hydrology, and meteorology are discussed. Sections are also included on the importance of drought, foreign needs for soil moisture information, some specific requirements for data information systems, and agency and organization uses of soil moisture. G.Y.

N79-16334*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE ESTIMATION USING REFLECTED SOLAR AND EMITTED THERMAL INFRARED RADIATION
R. D. Jackson, J. Cihlar, J. E. Estes, J. L. Heilman, A. Kahle, E. T. Kanemasu, J. Millard, J. C. Price, and C. L. Wiegand *In its* Soil Moisture Workshop Nov. 1978 47 p refs (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

Classical methods of measuring soil moisture such as gravimetric sampling and the use of neutron moisture probes are useful for cases where a point measurement is sufficient to approximate the water content of a small surrounding area. However, there is an increasing need for rapid and repetitive estimations of soil moisture over large areas. Remote sensing techniques potentially have the capability of meeting this need. The use of reflected-solar and emitted thermal-infrared radiation, measured remotely, to estimate soil moisture is examined. G.Y.

N79-16335*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE AND GAMMA RADIATION OBSERVATIONS OF SOIL MOISTURE
T. J. Schmugge, E. G. Njoku, E. Peck, and F. T. Ulaby *In its* Soil Moisture Workshop Nov. 1979 37 p refs (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

The unique dielectric properties of water at microwave

wavelengths afford the possibility for remotely sensing the moisture content in the surface layer of the soil. The surface emissivity and reflectivity for the soils at these wavelengths are strong functions of its moisture content. The changes in emissivity can be observed by passive microwave techniques (radiometry) and the change in reflectivity can be observed by active microwave techniques (radar). The difference in the natural terrestrial gamma ray flux measured for wet and dry soil may be used to determine soil moisture. The presence of water moisture in the soil causes an effective increase in soil density, resulting in an increased attenuation of the gamma flux for wet soil and a corresponding lower flux above the ground surface. G.Y.

N79-16336*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF SUMMARY AND RECOMMENDATIONS SESSION
In its Soil Moisture Workshop Nov. 1979 53 p (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

Discussion by discipline scientist and information users throughout the Workshop showed the diversity of opinion on the actual use of soil moisture information and the approaches which may lead to successful remote sensing measurements of soil moisture. Soil moisture has varying definitions and information needs depending on perspective of discipline and defined use. With these differences of need and definition, the summary panel provides summaries of the activities and recommendations with interaction from all participants of the Workshop. G.Y.

N79-16337*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECOMMENDATIONS
In its Soil Moisture Workshop Nov. 1979 5 p (For primary document see N79-16329 07-43)
Avail: NTIS HC A10/MF A01 CSCL 08M

Significant progress was made in the development of remote sensing techniques for estimating soil moisture, and some useful applications for soil moisture information was demonstrated. However, there is an array of questions that must be answered before an operational program is appropriate. A substantial research-oriented program is justified. A summary of recommendations made by participants in the workshop concerning future research and development is presented. These recommendations represent a consensus of opinions from the Workshop participants, but are not necessarily unanimous views. G.Y.

N79-16338*# General Electric Co., Philadelphia, Pa. Space Center.
SEASAT A SATELLITE SCATTEROMETER Final Report
R. Bianchi, A. Heath, S. Marsh, and J. Borusiewicz Nov. 1978 83 p
(Contract NAS1-14173)
(NASA-CR-158956) Avail: NTIS HC A05/MF A01 CSCL 05B

The analyses performed in the early period of the program which formed the basis of the sensor design is reviewed, along with the sensor design. The test program is outlined, listing all tests performed and the environmental exposure (simulated) for each, as applicable. Ground support equipment designed and built for assembly integration and field testing is described. The software developed during the program and the algorithms/flow diagrams which formed the bases for the software are summarized. J.A.M.

N79-16339*# Martin Marietta Corp., Denver, Colo.
EXPERIMENTAL AND SIMULATION STUDY RESULTS FOR VIDEO LANDMARK ACQUISITION AND TRACKING TECHNOLOGY Final Report
Roger T. Schappell, John C. Tietz, H. Michael Thomas, and James W. Lowrie Feb. 1979 82 p refs
(Contract NAS1-14489)
(NASA-CR-158997) Avail: NTIS HC A05/MF A01 CSCL 05B

A synopsis of related Earth observation technology is provided and includes surface-feature tracking, generic feature classification and landmark identification, and navigation by multicolor correlation. With the advent of the Space Shuttle era, the NASA role takes on new significance in that one can now conceive of dedicated Earth resources missions. Space Shuttle also provides a unique test bed for evaluating advanced sensor technology like that described in this report. As a result of this type of rationale, the FILE OSTA-1 Shuttle experiment, which grew out of the Video Landmark Acquisition and Tracking (VILAT) activity, was developed and is described in this report along with the relevant tradeoffs. In addition, a synopsis of FILE computer simulation activity is included. This synopsis relates to future required capabilities such as landmark registration, reacquisition, and tracking. G.Y.

N79-16340# Mullard Ltd., Southampton (England).
PYROELECTRIC DETECTOR DESIGNS FOR A FABRY-PEROT TYPE EARTH INFRA-RED HORIZON SENSOR
D. E. Charlton Paris ESA Jun. 1975 122 p refs
(Contract ESTEC-2341/74-AK)
(Rept-2069/R; ESA-CR(P)-1117) Avail: NTIS HC A06/MF A01

The possibilities of using pyroelectric arrays in Fabry-Perot type IR earth sensors were investigated. Digital sensors, in which the elements of a linear array are interrogated in turn, and analog-digital sensors, in which further signal processing is used to refine the position of the horizon, were considered. The finite breadth of the earth horizon, optical aberrations, and thermal spread lead to errors when the horizon is imaged close to the end of an element. Ways of reducing these errors are discussed. It was found that suitable choices of detector geometry can lead to sensors with a high pointing accuracy over the full field. The high element definition necessary for digital sensors will be best achieved using ceramic detectors. The analog-digital sensors can use the greater sensitivity of DTGS detectors. Transient noise in DTGS leads to the selection of an optimized polycrystalline lead zirconate titanate (PLZT) ceramic even for hybrid sensors. Detailed analysis shows that a 3 sigma pointing accuracy of about 0.02 deg can be achieved over the full field with both types of sensor. The hybrid sensor gives a marginally better accuracy using fewer detecting elements than the entirely digital sensor. Mechanical designs and fabrication techniques are described for selected cases. Author (ESA)

N79-16341# European Space Agency, Paris (France). Remote Sensing Working Group.
APPLICATIONS OF EARTH RESOURCES SATELLITE DATA TO DEVELOPMENT AID PROGRAMMES
Sep. 1978 64 p
(ESA-SP-1010) Avail: NTIS HC A04/MF A01

The requirements of developing countries for the kind of data and information that satellite systems (primarily LANDSAT) can provide are examined. These platforms and their sensors are considered as complementary to other aerospace platform and sensor combinations and to ground traversing and sampling programs. The most essential requirements are the maintenance and improvement of agricultural production, ordered ground water and mineral exploration and development, and the prediction of disasters. For these to be achieved without destroying environmental resources, integrated methodology and techniques are thought to provide the best framework for the necessary survey, inventory, census, and monitoring programs. Illustrations of some key applications are provided. The establishment of international regional centers of remote sensing that can acquire data, and then process, interpret, distribute and apply them, undertake pure and applied research, and provide education and training programs appropriate to the areas they serve is discussed. J.M.S.

N79-16342# Federal-State Land Use Planning Commission for Alaska, Anchorage.
NORTHERN ALASKA HYDROCARBON RESOURCES
Jerry D. Kreitner May 1978 79 p refs
(PB-287394/1; FSLUPCA-34) Avail: NTIS HC A05/MF A01 CSCL 10A

The private, federal, and state oil and gas initiatives in Northern Alaska over the past 35 years are brought together. It treats Northern Alaska oil and gas provinces as a planning unit, rather than using the classic (private, state, etc.) divisions. GRA

N79-16343# Federal-State Land Use Planning Commission for Alaska, Anchorage.

ALASKA NATURAL LANDSCAPES
Richard J. Gordon and Benjamin A. Shaine May 1978 82 p refs
(PB-287392/5; FSLUPCA-33) Avail: NTIS HC A05/MF A01 CSCL 08F

The landscapes of Alaska are described. Characteristic Alaska landscapes are identified and outstanding or representative areas that illustrate each type are described. GRA

N79-16344# State Univ. of New York at Plattsburgh.
REMOTE SENSING TO IDENTIFY, ASSESS, AND PREDICT ECOLOGICAL IMPACT ON LAKE CHAMPLAIN WETLANDS Final Report
Donald J. Bogucki and Gerhard K. Gruendling 1978 204 p refs Sponsored by Dept. of the Interior
(PB-287339/6; W78-12601; OWRT-C-6075(5210)(1)) Avail: NTIS HC A10/MF A01 CSCL 06C

The effect of lake level regulation on wetland plant communities and on the twelve priority wetlands of Lake Champlain was investigated. Topics discussed included: imagery acquisition and evaluation; development of a vegetation interpretation key; mapping procedures; physical characteristics of Lake Champlain wetlands; vegetative descriptions of Lake Champlain wetlands; effect of water levels on the growth of green timber habitat; and responses of major emergents and shrubs to naturally fluctuating Lake Champlain water levels. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-16345 City Univ. of New York.
MODELLING AND CONTROL OF A FLUIDIZED BED GASIFIER Ph.D. Thesis
Moshe Kutten 1978 182 p
Avail: Univ. Microfilms Order No. 7900791

An evaluation of the steady state and the dynamic behavior of an air blown fluidized bed coal gasifier to producing low BTU gas is presented. A simplified model of such a gasifier is presented. It is shown that the steady state range of control can be sometimes considerably smaller than indicated by purely hydrodynamic consideration, as lower flow rates can lead to higher conversions. The dynamic behavior shows a short time response dominated by the thermal inertia of the coal bed and a long time response, which is a function of the adjustment of the bed ash content to different flow rates. Both the dynamic and steady state features of the system strongly depend on the design of the system. The results of the thesis illustrates the type of problems that may be encountered and suggests some potential solutions. Dissert. Abstr.

N79-16346 California Univ., Los Angeles.
AEROELASTIC RESPONSE AND STABILITY OF A COUPLED ROTOR/SUPPORT SYSTEM WITH APPLICATION TO LARGE HORIZONTAL AXIS WITH TURBINES Ph.D. Thesis
William Warmbrodt 1978 326 p
Avail: Univ. Microfilms Order No. 7901415

The derivation of a governing set of nonlinear equations of motion for a coupled rotor/support system is presented. The model includes an n-bladed rotor with elastic blade flap and lead-lag degrees of freedom. The blades can have precone, pitch bearing offset, built-in twist, and cross sectional offsets between the aerodynamic center, the center of mass, and the elastic axis. The rotor support has two translational degrees of freedom and three rotational degrees of freedom. The general set of equations were specialized to analytically represent a coupled n-bladed rotor/fuselage model of a helicopter in hover or forward flight. The fuselage was modeled as a rigid body. Inertia, aerodynamic, structural, and gravitational loads are considered. Wind gusts in all three directions was included. Rotor/fuselage matching was performed by requiring force and moment equilibrium between the rotor and the fuselage. Dissert. Abstr.

N79-16347 Rensselaer Polytechnic Inst., Troy, N. Y.
A THEORETICAL ANALYSIS AND EXPERIMENTAL INVESTIGATION OF THE STIRLING CYCLE, WITH EMPHASIS ON THE SYSTEM AS A HEAT PUMP Ph.D. Thesis
Robert Peter Scaringe 1978 254 p
Avail: Univ. Microfilms Order No. 7900230

Three theoretical models of the Stirling Cycle as a heat pump were developed. They assume: no leakage, sinusoidal volume variations, constant rotational speed, steady state operation, ideal working fluid, and perfect mixing within the components. Computer generated graphs of the effects of altering the temperature, phase angle, cylinder volume ratio, regenerator dead space, cylinder dead space, heat transfer coefficients, and working fluid are presented. Computer generated graphs of pressure versus total volume, cylinder gas temperature versus rotational angle, and mass contained in each cylinder versus rotational angle are presented for various Stirling heat pump configurations. General trends and design procedures are outlined. Computer analysis of the theoretical models is discussed and a computer program is included. Areas of further research are described. Dissert. Abstr.

N79-16348 Texas Univ. at Austin.
INTEGRATED OPERATION OF WATER RESOURCE AND ELECTRIC POWER SYSTEMS Ph.D. Thesis
Sergio David Claure-Pereira 1978 258 p
Avail: Univ. Microfilms Order No. 7900550

A generalized heuristic procedure was developed to assist in searching for improved operation policies in conjunction with a simulation approach. This procedure has been programmed in FORTRAN IV (and called program RESOPT) for interactive use with the main simulation model (HEC-3). The purpose of computer program RESOPT is to determine a set of demands and operation rules for the water resource system such that average annual economic returns will be maximized. This technique was applied to study the operation of the Arkansas-White-Red-Osage river system in the southwest of the U.S. This system is composed of 28 reservoirs operated mainly for power generation, flood control, water supply, low flow augmentation, recreation, navigation, and irrigation. Significant increases in economic benefits were obtained when the system was operated under the conditions selected by the methodology herein developed. Dissert. Abstr.

N79-16349 Nebraska Univ. - Lincoln.
PARAMETER ESTIMATION AND VALIDATION OF A SOLAR ASSISTED HEAT PUMP MODEL Ph.D. Thesis
Bing Chen 1978 235 p
Avail: Univ. Microfilms Order No. 7900300

A methodology is described which employs parameter estimation techniques for a model that accurately simulates the performance of an existing solar assisted heat pump structure. The model will then serve as the basis for the future application of various techniques to determine optimal control strategies, to minimize component sizing and to evaluate the performance (by simulation) of alternate solar energy systems. The model described in this thesis incorporates onsite weather data, mechanical system characteristics, heat flow dynamics, and control logic. A set of difference equations is developed. A weighted least squares algorithm is employed to estimate the model's parameters. The model is used with a known weather profile to predict heat pump performance for comparison with actual performance data. Dissert. Abstr.

N79-16350 Florida Univ., Gainesville.
DETERMINATION OF ELECTRONIC PARAMETERS OF THE DIFFUSED LAYER AND SUBSTRATE OF P-n JUNCTION DIODES AND SOLAR CELLS Ph.D. Thesis
Pao-Jung Chen 1978 128 p
Avail: Univ. Microfilms Order No. 7900042

For the study, p(+) -n devices of single-crystal silicon are fabricated having substrate (base) doping concentrations covering

the range from about 10 to the 13th power/cu cm to about 10 to the 17th power/cu cm. A new method involving forward-biased capacitance measurements for determining the minority-carrier lifetime and diffusion length in the base region is shown to be accurate for silicon devices. A new analytic solution of the two-dimensional boundary value problem for the minority carriers enables inclusion of two dimensional effects. For devices having high base doping concentrations, two methods are used to show that the dark recombination current coming from the emitter exceeds that from the base by more than an order of magnitude. Various methods for determining the series resistance of p-n junction diodes and solar cells are described and compared. Dissert. Abstr.

N79-16351*# Gnostic Concepts, Inc., Menlo Park, Calif.
INDUSTRIALIZATION STUDY, PHASE 2 Final Report
5 Jan. 1979 129 p refs Prepared for JPL and DOE
(Contracts NAS7-100; JPL-954899)
(NASA-CR-158015) Avail: NTIS HC A07/MF A01 CSCL 10A

The potentials and requirements of advanced photovoltaic technologies still in their early developmental stages were evaluated and compared to the present day single crystal silicon wafer technology and to each other. The major areas of consideration include polycrystalline and amorphous silicon, single crystal and polycrystalline gallium arsenide, and single crystal and polycrystalline cadmium sulfide. A rank ordering of the advanced technologies is provided. The various ranking schemes were based upon present-day efficiency levels, their stability and long-term reliability prospects, material availability, capital investments both at the laboratory and production level, and associated variable costs. An estimate of the timing of the possible readiness of these advanced technologies for technology development programs and industrialization is presented along with a set of recommended government actions concerning the various advanced technologies. A.R.H.

N79-16352# Committee on Interstate and Foreign Commerce (U. S. House).
ENERGY AND THE ECONOMY: THE ECONOMIC IMPACT OF ALTERNATIVE ENERGY SUPPLY-DEMAND ASSUMPTIONS
Washington GPO 1978 34 p refs Study for Subcomm. on Energy and Power of the Comm. on Interstate and Foreign Commerce, Apr. 1978 Prepared by Library of Congr., Congressional Res. Service
(H-Print-95-51; GPO-22-673) Avail: Subcomm. on Energy and Power

Several energy scenarios were developed and an attempt to measure the impact of these on the U.S. economy is made. The energy scenarios are studied as cases and include: base case; conservation case; high electric case; high oil case; and some caveates. The economic impacts studied are: employment and unemployment; inflation; investment; personal consumption; and foreign trade. Figures and data tables are presented. G.Y.

N79-16353# Committee on Interstate and Foreign Commerce (U. S. House).
INDUSTRIAL ENERGY CONSERVATION
Washington GPO 1978 171 p refs Hearings on H.R. 8985 before the Subcomm. on Energy and Power of the Comm. on Interstate and Foreign Commerce, 95th Congr., 1st Sess., 27 and 29 Sep. 1977
(GPO-24-067) Avail: Subcomm. on Energy and Power

A Bill, H.R. 8985, is introduced which requires the Department of Energy to establish test procedures, labeling rules, and energy efficiency standards for electric motors and pumps, and for other purposes. Representatives from Government and industry give testimony on the proposed Bill. G.Y.

N79-16354*# North Alabama Scientific and Engineering Consultants, Inc., Huntsville.
STUDY OF SOLAR CELL WELDS Final Report
Gary L. Workman 7 Nov. 1978 30 p
(Contract NAS8-33077)
(NASA-CR-150887) Avail: NTIS HC A03/MF A01 CSCL 10A

The thermal imaging technique was evaluated for its capabilities in the nondestructive evaluation of solar cell welds. The temperature and spatial resolution of state of the art instrumentation was sufficient for both qualitative and quantitative determination of the quality of solar cell welds. The addition of color digitized thermography enhanced the aspects of the thermographic display and allowed easily computerized testing procedures. For automated testing systems an accurate correlation of weld quality with temperature profiles of the welds needs to be performed. In comparison, the holographic technique was complementary with the thermal imaging technique, except that the holographic analysis appeared to be more quantitative at the present time. However, the thermal imaging approach is much more versatile in overall capabilities. Author

N79-16355*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POWER TRAIN ANALYSIS FOR THE DOE/NASA 100-kW WIND TURBINE GENERATOR Final Report
Robert C. Seidel, Harold Gold, and Leon M. Wenzel Oct. 1978 57 p refs Prepared for DOE
(Contract E(49-26)-1028)
(NASA-TM-78997; DOE/NASA/1028-78/19; E-9413) Avail: NTIS HC A04/MF A01 CSCL 10A

Progress in explaining variations of power experienced in the on-line operation of a 100 kW experimental wind turbine-generator is reported. Data are presented that show the oscillations tend to be characteristic of a wind-driven synchronous generator because of low torsional damping in the power train, resonances of its large structure, and excitation by unsteady and nonuniform wind flow. The report includes dynamic analysis of the drive-train torsion, the generator, passive driveline damping, and active pitch control as well as correlation with experimental recordings. The analysis assumes one machine on an infinite bus with constant generator-field excitation. Author

N79-16356*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BASELINE PERFORMANCE OF THE GPU 3 STIRLING ENGINE
Lanny G. Thieme and Roy C. Tew, Jr. Nov. 1978 14 p refs Presented at the Highway Vehicle Systems Contractors Coordination Meeting, Dearborn, Michigan, 17-20 Oct. 1978
(Contract EC-77-A-31-1040)
(NASA-TM-79038; E-9838; DOE/NASA/1040-78/5) Avail: NTIS HC A02/MF A01 CSCL 10B

A 10 horsepower single-cylinder rhombic-drive Stirling engine was converted to a research configuration to obtain data for validation of Stirling computer simulations. The engine was originally built by General Motors Research Laboratories for the U.S. Army in 1965 as part of a 3 kW engine-generator set, designated the GHU 3 (Ground Power Unit). This report presents test results for a range of heater gas temperatures, mean compression-space pressures, and engine speeds with both helium and hydrogen as the working fluids. Also shown are initial data comparisons with computer simulation predictions. Author

N79-16357*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN OPERATING 200-kW HORIZONTAL AXIS WIND TURBINE
Charles L. Hunnicutt (Lockheed Aircraft Service Co., Ontario, Calif.), Bradford Linscott, and Robert A. Wolf 1978 25 p Presented at 23rd Natl. SAMPE Symp. and Exhibition, Anaheim, Calif., 2-4 May 1978
(Contract E(49-26)-1004)
(NASA-TM-79034; E-9833) Avail: NTIS HC A02/MF A01 CSCL 10B

The Mod-OA wind turbine blades were rotated for the first time on November 30, 1977, establishing the Mod-OA as the first wind-driven generator in 35 years to be continually tied into an electrical power system which services a community. Tower-mounted equipment and blade structural design and fabrication are discussed. J.M.S.

N79-16358*# AeroChem Research Labs., Inc., Princeton, N. J.
SILICON HALIDE-ALKALI METAL FLAMES AS A SOURCE OF SOLAR GRADE SILICON Quarterly Report

D. B. Olsen and W. J. Miller Jan. 1979 15 p refs Sponsored by DOE and JPL
(Contract JPL-954777)
(NASA-CR-158091; AeroChem-TN-201; JPL-954777-79/6; QR-6) Avail: NTIS HC A02/MF A01 CSCL 10A

The feasibility of using alkali metal-silicon halide diffusion flames to produce solar-grade silicon in large quantities and at low cost is demonstrated. Prior work shows that these flames are stable and that relatively high purity silicon can be produced using Na + SiCl4 flames. Silicon of similar purity is obtained from Na + SiF4 flames although yields are lower and product separation and collection are less thermochemically favored. Continuous separation of silicon from the byproduct alkali salt was demonstrated in a heated graphite reactor. The process was scaled up to reduce heat losses and to produce larger samples of silicon. Reagent delivery systems, scaled by a factor of 25, were built and operated at a production rate of 0.5 kg Si/h. Very rapid reactor heating rates are observed with wall temperatures reaching greater than 2000 K. Heat release parameters were measured using a cooled stainless steel reactor tube. A new reactor was designed. G.Y.

N79-16359*# IBM Federal Systems Div., Huntsville, Ala.
SYSTEM DESIGN PACKAGE FOR SIMS PROTOTYPE SYSTEM 3, SOLAR HEATING AND DOMESTIC HOT WATER
Nov. 1978 80 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150840) Avail: NTIS HC A05/MF A01 CSCL 10B

A collation of documents and drawings are presented that describe a prototype solar heating and hot water system using liquid flat plate collectors and a gas or electric furnace energy subsystem. The system was designed for installation into a single-family dwelling. The description, performance specification, subsystem drawings, verification plan/procedure, and hazard analysis of the system are packaged for evaluation of the system with information sufficient to assemble a similar system. G.Y.

N79-16360*# Owens-Illinois, Inc., Toledo, Ohio. Solar Energy Products Group.
QUALIFICATION TEST AND ANALYSIS REPORT: SOLAR COLLECTORS
Dec. 1978 147 p Prepared for DOE
(Contract NAS8-32259)
(NASA-CR-150860) Avail: NTIS HC A07/MF A01 CSCL 10B

Test results show that the Owens-Illinois Sunpak TM Model SEC 601 air-cooled collector meets the national standards and codes as defined in the Subsystem Peformance Specification and Verification Plan of NASA/MSFC, dated October 28, 1976. The program calls for the development, fabrication, qualification and delivery of an air-cooled solar collector for solar heating, combined heating and cooling, and/or hot water systems. G.Y.

N79-16361*# IBM Federal Systems Div., Huntsville, Ala.
SYSTEM DESIGN PACKAGE FOR SIMS PROTOTYPE SYSTEM 4, SOLAR HEATING AND DOMESTIC HOT WATER
Nov. 1978 145 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-150839) Avail: NTIS HC A07/MF A01 CSCL 10B

The system consisted of a modular designed prepackaged solar unit, containing solar collectors, a rock storage container, blowers, dampers, ducting, air-to-water heat exchanger, DHW preheat tank, piping, and system controls. The system was designed to be installed adjacent to a small single family dwelling. The description, performance specification, subsystem drawings, verification plan/procedure, and hazard analysis of the system were packaged for evaluation. J.A.M.

N79-16362*# Crystal Systems, Inc., Salem, Mass.
SILICON INGOT CASTING: HEAT EXCHANGER METHOD. MULTI-WIRE SLICING: FIXED ABRASIVE SLICING TECHNIQUE, PHASE 3 Quarterly Progress Report, 15-31 Dec. 1978
Frederick Schmid and Chandra P. Khattak Jan. 1979 19 p refs Sponsored by NASA and DOE
(Contract JPL-954373)
(NASA-CR-158084; QPR-1; JPL-954373-79/8; DRL-58-DRD-SE-7) Avail: NTIS HC A02/MF A01 CSCL 10A

In the area of ingot casting the proof of concept of heat exchanger method (HEM) was established. It was also established that HEM cast silicon yielded solar cell performance comparable to Czochralski grown material. Solar cells with conversion efficiencies of up to 15% were fabricated. It was shown that square cross-section ingots can be cast. In the area of crystal slicing, it was established that silicon can be sliced efficiently with the fixed abrasive slicing technique approach. This concept was carried forward to 10 cm diameter workpiece. J.A.M.

N79-16363*# Battelle Columbus Labs., Ohio.
EVALUATION OF SELECTED CHEMICAL PROCESSES FOR PRODUCTION OF LOW-COST SILICON, PHASES 1 AND 2 Final Report, 9 Oct. 1975 - 9 Jul. 1978
J. M. Blocher and M. F. Browning 9 Jul. 1978 125 p refs Prepared for DOE and JPL
(Contracts NAS7-100; JPL-954339)
(NASA-CR-158085; DOE/JPL-954339-78/11) Avail: NTIS HC A06/MF A01 CSCL 10A

A miniplant, consisting of a 5 cm-diameter fluidized-bed reactor and associated equipment was used to study the deposition parameters, temperature, reactant composition, seed particle size, bed depth, reactant throughput, and methods of reactant introduction. It was confirmed that the permissible range of fluidized-bed temperature was limited at the lower end by zinc condensation (918 C) and at higher temperatures by rapidly decreasing conversion efficiency. Use of a graded bed temperature was shown to increase the conversion efficiency over that obtained in an isothermal bed. Other aspects of the process such as the condensation and fused-salt electrolysis of the ZnCl2 by-product for recycle of zinc and chlorine were studied to provide information required for design of a 50 MT/year experimental facility. In view of the favorable technical and economic indications obtained, it was recommended that construction and operation of the 50 MT/year experimental facility be implemented. L.S.

N79-16364*# Westinghouse Research and Development Center, Pittsburgh, Pa.
SILICON MATERIALS TASK OF THE LOW COST SOLAR ARRAY PROJECT. PHASE 3: EFFECT OF IMPURITIES AND PROCESSING ON SILICON SOLAR CELLS Quarterly Report, Oct. - Dec. 1978
R. H. Hopkins, J. R. Davis, P. D. Blais, A. Rohatgi, R. B. Campbell, P. Rai-Choudhury, H. C. Mollenkopf (Dow Corning Corp.), and J. R. McCormick (Dow Corning Corp.) Jan. 1979 52 p refs Prepared for JPL and DOE
(Contract JPL-954331)
(NASA-CR-158092; JPL-954331-79/1; QR-13) Avail: NTIS HC A04/MF A01 CSCL 10A

The 13th quarterly report of a study entitled an Investigation of the Effects of Impurities and Processing on Silicon Solar Cells is given. The objective of the program is to define the effects of impurities, various thermochemical processes and any impurity-process interactions on the performance of terrestrial silicon solar cells. The Phase 3 program effort falls in five areas: (1) cell processing studies; (2) completion of the data base and impurity-performance modeling for n-base cells; (3) extension of p-base studies to include contaminants likely to be introduced during silicon production, refining or crystal growth; (4) anisotropy effects; and (5) a preliminary study of the permanence of impurity effects in silicon solar cells. The quarterly activities for this report focus on tasks (1), (3) and (4). G.Y.

N79-16365*# Varian Associates, Lexington, Mass. Lexington Vacuum Div.
SLICING OF SILICON INTO SHEET MATERIAL: SILICON SHEET GROWTH DEVELOPMENT FOR THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SILICON SOLAR ARRAY PROJECT Quarterly Report, 19 Jun. 1978 - 27 Oct. 1978
J. R. Fleming 20 Nov. 1978 40 p Sponsored in part by DOE

(Contracts NAS7-100; JPL-954374)
(NASA-CR-158082; JPL-954374-78/1; QR-10) Avail: NTIS HC A03/MF A01 CSCL 10A

The limits of blade tolerance were defined. The standard blades are T-2 thickness tolerance. Good results were obtained by using a slurry fluid consisting of mineral oil and a lubricity additive. Adjustments of the formulation and fine tuning of the cutting process with the new fluid are necessary. Test results and consultation indicate that the blade breakage encountered with water based slurries is unavoidable. Two full capacity (974 wafer) runs were made on the large prototype saw. Both runs resulted in extremely low yield. However, the reasons for the low yield were lack of proper technique rather than problems with machine function. The test on the effect of amount of material etched off of an as-sawn wafer on solar cell efficiency were completed. The results agree with previous work at JPL in that the minimum material removed per side that gives maximum efficiency is on the order of 10 microns. G.Y.

N79-16366*# Hughes Research Labs., Malibu, Calif.
GaAs SOLAR CELL DEVELOPMENT Quarterly Report, 25 Oct. 1978 - 25 Jan. 1979
Jan. 1979 18 p Sponsored by NASA Prepared for JPL
(Contract JPL-955062)
(NASA-CR-158090; QR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

The four (AlGa)As-GaAs solar cells were fabricated and will be delivered for radiation damage testing using 1 MeV electrons. These cells were LPE grown at 700 C for 4 minutes. The junction depth was measured to be 0.3 micron using a secondary electron microscope. The radiation model for the shallow junction cells was verified. Some mesa diodes were also fabricated and will be irradiated along with the cells for parallel evaluations of their electrical characteristics. J.A.M.

N79-16367*# Aerospace Corp., El Segundo, Calif. Ivan A. Getting Labs.
LOW COST SOLAR ARRAY PROJECT: COMPOSITION MEASUREMENTS BY ANALYTICAL PHOTON CATALYSIS Quarterly Report, 1 Nov. - 31 Dec. 1978
David G. Sutton, Luis Galvan, James Melzer, and Raymond F. Heidner, III 1978 25 p refs Prepared for DOE and JPL
(Contract NAS7-100)
(NASA-CR-158085; DOE/JPL-955201-78/1; QR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The applicability of the photon catalysis technique for effecting composition analysis of silicon samples is assessed. In particular, the technique is to be evaluated as a detector for the impurities Al, Cr, Fe, Mn, Ti, V, Mo and Zr. During the first reporting period Al, Cr, Fe and Mn were detected with the photon catalysis method. The best fluorescence lines to monitor and determined initial sensitivities to each of these elements by atomic absorption calibration were established. In the course of these tests, vapor pressure curves for these four pure substances were mapped. G.Y.

N79-16368*# Solarex Corp., Rockville, Md.
EVALUATION OF THE TECHNICAL FEASIBILITY AND EFFECTIVE COST OF VARIOUS WAFER THICKNESSES FOR THE MANUFACTURE OF SOLAR CELLS Quarterly Progress Report, 15 Jul. 1978 - 30 Sep. 1978
1978 26 p Sponsored in part by DOE
(Contract JPL-955077; NAS7-100)
(NASA-CR-158095; QPR-1; JPL-955077-78/3) Avail: NTIS HC A03/MF A01 CSCL 10A

Three wafering demonstration runs were completed on the Yasunaga wire saw. Wafer thickness/taper uniformity is excellent. Many small problems were encountered with Yasunaga accessories, slowing the effort. A wafer characterization cycle was defined and will be initiated during the next period. Author

N79-16369*# Kayex Corp., Rochester, N. Y.
CONTINUOUS CZOCHRALSKI GROWTH: SILICON SHEET GROWTH DEVELOPMENT OF THE LARGE AREA SILICON SHEET TASK OF THE LOW COST SILICON SOLAR ARRAY PROJECT Annual Progress Report, 1 Oct. 1977 - 30 Sep. 1978
1978 54 p Sponsored by DOE and JPL
(NASA-CR-158096; JPL-954888-78/4; APR-1) Avail: NTIS HC A04/MF A01 CSCL 10A

The primary objective of this contract is to develop equipment and methods for the economic production of single crystal ingot material by the continuous Czochralski (CZ) process. Continuous CZ is defined for the purpose of this work as the growth of at least 100 kilograms of ingot from only one melt container. During the reporting period (October, 1977 - September, 1978), a modified grower was made fully functional and several recharge runs were performed. The largest run lasted 44 hours and over 42 kg of ingot was produced. Little, if any, degradation in efficiency was observed as a result of pulling multiple crystals from one crucible. Solar efficiencies observed were between 9.3 and 10.4% AMO (13.0 and 14.6% AMI) compared to 10.5% (14.7% AMI) for optimum CZ material control samples. Using the SAMICS/IPEG format, economic analysis of continuous CZ suggests that 1986 DoE cost goals can only be met by the growth of large diameter, large mass crystals. Author

N79-16370*# Owens-Illinois, Inc., Toledo, Ohio.
ANALYSIS AND EXPERIMENTAL TESTS OF A HIGH-PERFORMANCE EVACUATED TUBULAR COLLECTOR
D. C. Beekley and G. R. Mather, Jr. Dec. 1978 56 p refs Prepared for DOE
(Contract NAS8-32259)
(NASA-CR-150874) Avail: NTIS HC A04/MF A01 CSCL 10B

A high-performance collector based on the use of all-glass, evacuated tubular collector elements is described and analyzed, and supporting experimental data presented. The collector operated with excellent efficiency at temperatures high enough to drive existing air conditioning units, and showed good performance under diffuse light and low insolation conditions. Collector efficiency was insensitive to operating temperature, ambient temperature, and wind speed. In addition, air, as well as liquid, can be used as the heat transfer fluid, with no significant performance penalty. While the equations governing the useful energy produced can be cast in a form similar to that for flat plate collectors, several important parameters were unique in a number of respects. The loss coefficient was unusually low, while the flow factor and effective insolation were unusually high. Author

N79-16371*# Battelle Columbus Labs., Ohio.
DEVELOPMENT AND EVALUATION OF DIE AND CONTAINER MATERIALS Quarterly Progress Report, 1 Oct. 1978 - 31 Dec. 1978
R. R. Wills and D. E. Niesz 15 Jan. 1979 33 p refs Prepared for DOE
(Contract NAS7-100; JPL-954876)
(NASA-CR-158087; QPR-5; DOE/JPL-954876-79/1) Avail: NTIS HC A03/MF A01 CSCL 10A

X = 0.75 Beta prime Sialon (a silicon aluminum oxynitride) and Sibeon (silicon beryllium oxynitride) are promising die materials. In sessile drop tests in contact with molten silicon, beryllium contamination was less than ppm and aluminum contamination 50 ppm. A shaping die of the Sialon material was successfully fabricated. Dry milling studies for the preparation of Si_3N_4-Al_2O_3-ALN mixtures were performed with butanol, acetic anhydride, oleic acid, and triethanolamine milling aids. Optimum mixing was achieved with 0.15 percent triethanolamine using a milling time of 8 hours. Preliminary evaluation of Sibeon materials indicates that they are more resistent to molten silicon attack than Sialon. Silicon contamination from the beryllium was less than aluminum contamination even though the aluminum impurity level in the Sibeon was only 450 to 1300 ppm. Work designed to produce an aluminum-free Sibeon is described. Author

N79-16372*# Solaron Corp., Denver, Colo.
PROTOTYPE SOLAR HEATING AND COOLING SYSTEMS INCLUDING POTABLE HOT WATER Quarterly Reports, Nov. 1976 - Jun. 1977
Dec. 1978 89 p Prepared for DOE
(Contract NAS8-32249)
(NASA-CR-150861) Avail: NTIS HC A05/MF A01 CSCL 10B

Progress is reviewed in the development, delivery, and support

of two prototype solar heating and cooling systems including potable hot water. The system consisted of the following subsystems: collector, auxiliary heating, potable hot water, storage, control, transport, and government-furnished site data acquisition. J.A.M.

N79-16373*# Solar Engineering and Equipment Co., Metairie, La.
INSTALLATION PACKAGE FOR HYDE MEMORIAL OBSERVATORY, LINCOLN, NEBRASKA
Dec. 1978 36 p Prepared for DOE
(Contract NAS8-32247)
(NASA-CR-150867) Avail: NTIS HC A03/MF A01 CSCL 10B

Installation information for a solar heating system installed in Hyde Memorial Observatory at Lincoln, Nebraska is presented. This package included a system operation and maintenance manual, hardware brochures, schematics, system operating modes, and drawings. This prototype solar heating system consisted of the following subsystems: solar collector, control, and storage. J.A.M.

N79-16374*# Energy Research Corp., Bethel, Conn.
FABRICATION AND TESTING OF SILVER-HYDROGEN CELLS
M. G. Klein Nov. 1978 48 p
(Contract NAS3-19780)
(NASA-CR-159431) Avail: NTIS HC A03/MF A01 CSCL 10B

The development and life testing of single electrode and multi electrode stacks to optimize the individual components and characterize the performance of a silver hydrogen battery system are described. A NASA-developed inorganic separator material was used as the main separator within the cells. Single electrode test cells were cycled at 75% of nominal capacity out through approximately 1,000 cycles in a number of cases where deterioration in performance was observed. This deterioration appears to be a decay in usable capacity of the silver electrode; but the exact mechanism is still unidentified. Twenty ampere-hour boilerplate test cells consisting of a stack of ten silver electrodes and twenty hydrogen electrodes were cycled also at 75% depth of discharge. The oldest stack achieved 522 stable cycles to the end of the program. Weight analysis of light-weight cells showed that 50 ampere-hour cells with improved components could be capable of as much as 40 watt hours per pound. A.R.H.

N79-16375*# Energy Research Corp., Bethel, Conn.
FABRICATION AND TESTING OF SILVER-HYDROGEN CELLS
Daniel J. DeBicarri and Allen Charkey Dec. 1978 26 p
(Contract NAS3-20805)
(NASA-CR-159490) Avail: NTIS HC A03/MF A01 CSCL 10B

Silver electrodes containing various additives were fabricated and tested in single electrode cells in order to improve the electrochemical utilization of sintered silver cathodes in Ag-H2 aerospace batteries. A standard stack arrangement was used which featured a NASA-developed organic-inorganic separator. All cells were cycled in a regime designed to remove 75% of the cells nominal capacity based on 3.3 gms/AHr Ag utilization. In cases where performance degradation was observed, the main feature mode appeared to be corrosion of either the expanded silver current collector or the connection between the silver electrode and the electrode tab. Promising silver electrodes from single electrode studies were used in the construction of 35 AHr Ag-H2 cells. Two such cells were constructed and installed in heavy walled pressure vessels for testing. Based on the data obtained from all cells tested during the program, four lightweight 35 AHr cells were fabricated. During acceptance testing these cells yielded an average gravimetric energy density of 30 WHr/1b. A.R.H.

N79-16376*# Union Carbide Corp., New York.
LOW COST SILICON SOLAR ARRAY PROJECT: FEASIBILITY OF LOW-COST, HIGH-VOLUME PRODUCTION OF SILANE AND PYROLYSIS OF SILANE TO SEMICONDUCTOR-GRADE SILICON Quarterly Progress Report, Jul. - Sep. 1978
W. C. Breneman Sep. 1978 84 p refs Sponsored by NASA Prepared for DOE and JPL
(Contract JPL-954334)
(NASA-CR-158097; DOE/JPL-954334-78/8) Avail: NTIS HC A05/MF A01 CSCL 10A

Silicon epitaxy analysis of silane produced in the Process Development Unit operating in a completely integrated mode consuming only hydrogen and metallurgical silicon resulted in film resistivities of up to 120 ohms cm N type. Preliminary kinetic studies of dichlorosilane disproportionation in the liquid phase have shown that 11.59% SiH4 is formed at equilibrium after 12 minutes contact time at 56 C. The fluid-bed reactor was operated continuously for 48 hours with a mixture of one percent silane in helium as the fluidizing gas. A high silane pyrolysis efficiency was obtained without the generation of excessive fines. Gas flow conditions near the base of the reactor were unfavorable for maintaining a bubbling bed with good heat transfer characteristics. Consequently, a porous agglomerate formed in the lower portion of the reactor. Dense coherent plating was obtained on the silicon seed particles which had remained fluidizied throughout the experiment. Author

N79-16377*# Burns and McDonnell, Kansas City, Mo.
ASSESSMENT OF THE POTENTIAL OF SOLAR THERMAL SMALL POWER SYSTEMS IN SMALL UTILITIES Final Report
P. Steitz, L. G. Mayo, and S. P. Perkins, Jr. Nov. 1978 222 p refs Prepared for JPL and DOE
(Contract JPL-954971)
(NASA-CR-158093; JPL-1060-14; Doc-78-008-4-000) Avail: NTIS HC A10/MF A01 CSCL 10B

The potential economic benefit of small solar thermal electric power systems to small municipal and rural electric utilities is assessed. Five different solar thermal small power system configurations were considered in three different solar thermal technologies. The configurations included: (1) 1 MW, 2 MW, and 10 MW parabolic dish concentrators with a 15 kW heat engine mounted at the focal point of each dish, these systems utilized advanced battery energy storage; (2) a 10 MW system with variable slat concentrators and central steam Rankine energy conversion, this system utilized sensible thermal energy storage; and (3) a 50 MW central receiver system consisting of a field of heliostats concentrating energy on a tower-mounted receiver and a central steam Rankine conversion system, this system also utilized sensible thermal storage. The results are summarized in terms of break-even capital costs. The break-even capital cost was defined as the solar thermal plant capital cost which would have to be achieved in order for the solar thermal plants to penetrate 10 percent of the reference small utility generation mix by the year 2000. The calculated break-even capital costs are presented. F.O.S.

N79-16378*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ANALYSIS AND EVALUATION OF PROCESS AND EQUIPMENT IN TASKS 2 AND 4 OF THE LOW COST SOLAR ARRAY PROJECT Quarterly Report, Oct. 1977 - Jan. 1978
H. Goldman and M. Wolf Aug. 1978 118 p refs Sponsored by NASA and DOE
(Contract JPL-954796)
(NASA-CR-158089; DOE/JPL-954796-77/1) Avail: NTIS HC A06/MF A01 CSCL 10A

Several experimental and projected Czochralski crystal growing process methods were studied and compared to available operations and cost-data of recent production Cz-pulling, in order to elucidate the role of the dominant cost contributing factors. From this analysis, it becomes apparent that substantial cost reductions can be realized from technical advancements which fall into four categories: an increase in furnace productivity; the reduction of crucible cost through use of the crucible for the equivalent of multiple state-of-the-art crystals; the combined effect of several smaller technical improvements; and a carry over effect of the expected availability of semiconductor grade polysilicon at greatly reduced prices. A format for techno-economic analysis of solar cell production processes was developed, called the University of Pennsylvania Process Characterization (UPPC) format. The accumulated Cz process data are presented. Author

N79-16379# British Aerospace Dynamics Group, Bristol (England). Electronic and Space Systems.
STUDY ON SOLAR ARRAYS FOR PROGRAMMES LEADING FROM THE EXTENSION OF SPACELAB TOWARDS SPACE PLATFORMS Final Report
P. R. C. Gillett Paris ESA Jun. 1978 98 p
(Contract ESA-3404/77-F-HEW(SC))
(ESS/SS-878; ESA-CR(P)-1112) Avail: NTIS
HC A05/MF A01

A description of the major requirements of a set of candidate missions is presented and some preliminary solar array designs are given. A development strategy is outlined and the principal areas of new technology identified. J.M.S.

N79-16380# Utah State Univ., Logan. Dept. of Sociology, Social Work, and Anthropology.
LOCAL PERCEPTIONS OF ENERGY DEVELOPMENT: THE CASE OF THE KAIPAROWITS PLATEAU
Stephan B. LoveJay, Jeni M. Varady, ed., and Orson L. Anderson, ed. Nov. 1977 79 p refs Sponsored by NSF
(PB-287314/9; Bull-62; NSF/RA-770592) Avail: NTIS
HC A05/MF A01 CSCL 10A

Proposed energy developments in the predominantly rural Four Corners area of the Southwest are threatening the residents' lifestyles. Data from a simple random sample of household heads in several rural communities in southern Utah and northern Arizona lend support to the proposition that the local citizens are eager to have large-scale energy projects in the Four Corners region. The citizens are willing to exchange elements of their current lifestyles for what are perceived as economic and employment benefits. The analysis presented here suggests that they tend to overemphasize the expected benefits while de-emphasizing, or remaining ignorant of potential disadvantages resulting from such developments. Some explanations for this behavior are examined. GRA

N79-16381# Atlantic Research Corp., Alexandria, Va.
HOME ENERGY COST-CUTTING CLINIC
R. Naismith, S. Swope, and R. S. Callander Aug. 1978 116 p refs Sponsored by the Commonwealth of Va.
(PB-287344/6; TR-PL-10736-Rev) Avail: NTIS
HC A06/MF A01 CSCL 10A

Text and figures used in Virginia state-wide homeowner energy education programs are documented. It was successfully used in over 400 presentations to over 30,000 citizens. The text includes instructions for presenters as well as the actual program material which includes a discussion of how heat flows, how energy is used in the home, and methods for reducing energy use. GRA

N79-16382# Hawaii Univ., Honolulu. Dept. of Meteorology.
OAHU WIND POWER SURVEY
Colin S. Ramage, P. Anders Daniels, Thomas A. Schroeder, and Noel J. Thompson May 1977 44 p refs Sponsored in part by Hawaii Natural Energy Inst., Honolulu
(Grant NSF AER-76-05596)
(PB-287361/0; UHMET-77-01) Avail: NTIS
HC A03/MF A01 CSCL 04A

At seventeen potentially windy sites, calibrated anemometers and wind vanes were installed and recordings made on computer-processable magnetic tape cassettes. From monthly mean wind speeds--normalized by comparing with Honolulu Airport mean winds--it was concluded that about 23 mi/hr represented the highest average annual wind speed likely to be attained on Oahu and that the Koko Head and Kahuku areas gave the most promise for wind energy generation. Diurnal variation of the wind in these areas roughly parallels diurnal variation of electric power demand. GRA

N79-16383# Hawaii Univ., Honolulu. Dept. of Meteorology.
KAUAI WIND POWER SURVEY. PART 1: MOBILE SAMPLING PROGRAM, 19 AUGUST - 5 SEPTEMBER 1977
Colin S. Ramage and Norman E. Oshiro Nov. 1977 35 p refs Sponsored in part by Hawaii State Dept. of Planning and Economic Development, Honolulu
(Grant NSF AER-76-05596)
(PB-287350/3; UHMET-77-05-Pt-1; NSF/RA-770651) Avail: NTIS HC A03/MF A01 CSCL 04A

A wind power survey of Hawaii was conducted. A van-mounted anemometer was set up at each of 47 sites for at least 24 hours. The probable long-term average wind speed at each site was estimated by comparing the measured wind speeds to simultaneous observations made of Lihue Airport. This mobile field survey was designed to find where the winds were strongest, to describe their diurnal variation and to identify sites for fixed stations where long period monitoring should be undertaken. GRA

N79-16384# National Bureau of Standards, Washington, D. C. Center for Building Technology.
THE EFFECTS OF RESOURCE IMPACT FACTORS ON ENERGY CONSERVATION STANDARDS FOR BUILDINGS Final Report
Sep. 1978 61 p refs Sponsored by DOE
(PB-286909/7; NBS-BSS-114; LC-78-606072) Avail: NTIS
HC A04/MF A01 CSCL 10A

The proper price for energy to be used in the development of optimum (i.e., cost-effective) energy conservation performance standards for buildings is considered. It is shown that the appropriate price for energy is its social value, which can be determined through the development and application of resource impact factors (RIF's). Some guidelines are provided for the formulation and development of RIF's. A life-cycle cost minimization model for determining the optimum conservation standard is employed to show how the use of RIF's would generally lower the maximum allowable energy consumption specified in the standard. Finally, geometric and algebraic measures are derived for the net gain in economic efficiency that would result from using RIF's in developing energy conservation performance standards. GRA

N79-16385# Office of the County Clerk, El Centro, Calif.
GEOTHERMAL ELEMENT, IMPERIAL COUNTY, CALIFORNIA
S. Edmunds, J. Sullivan, and M. Goldsmith 1977 156 p
(Grant NSF AER-75-08793)
(PB-287115/0; NSF/RA-770652) Avail: NTIS
HC A08/MF A01 CSCL 10A

Research methodology a brief history of geothermal development in the county, and a general history and physical characteristics of the county are described. A framework of the county master plan for geothermal development, its implications, and short and long range planning procedures was also considered. GRA

N79-16386# Hawaii Univ., Honolulu.
ASSESSMENT OF THE POTENTIAL OF SOLAR ENERGY IN HAWAII Final Report
Takeshi Yoshihara and Paul C. Ekern Jan. 1978 85 p refs
(Grant NSF AER-76-05596)
(PB-287475/8; NSF/RA-780201) Avail: NTIS
HC A05/MF A01 CSCL 04A

An Eppley precision radiometer was the primary standard against which the other network Eppley 8-48 pyranometers were compared. Global radiation on a 21 degree south face and diffuse radiation were also measured. Integrated data, stored as hourly values were printed on paper tape, assessed for quality, then transferred to cards for computer analysis. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-16387 Rutgers - The State Univ., New Brunswick, N. J.
THE DEVELOPMENT AND PERFORMANCE OF A TSEE DOSIMETRY SYSTEM FOR ENVIRONMENTAL MONITORING Ph.D. Thesis
Eileen Hotte 1978 134 p
Avail: Univ. Microfilms Order No. 7901268

A description of a thermally stimulated exoelectron emission dosimetry system is presented. Counting instrumentation was assembled and TSEE materials were selected and tested. Field studies involved a comparison of the TSEE system with two

other detectors. A gas-flow proportional counter was modified for use as the TSEE counter. Several materials were investigated for use as the dosimeter including different physical forms of LiF and CaSO4, and BeO as a ceramic disk. Initial testing showed BeO able to out-perform the other materials. The area chosen for field testing was Salem Nuclear Generating Station in central New Jersey. CaSO4 thermoluminescent dosimeters were placed at four monitoring sites around the Station for a 13-week period during the summer of 1977. The BeO TSEE dosimeters were placed at the same sites for 2-week intervals throughout the summer. Dissert. Abstr.

N79-16388 Rutgers - The State Univ., New Brunswick, N. J.
STIMULATED BIODEGRADATION OF WASTE PETROLEUM Ph.D. Thesis
John Thomas Dibble 1978 160 p
Avail: Univ. Microfilms Order No. 7901249

Petroleum spilled on land or water not contained and collected will eventually be subject to biodegradation. The disposal of refinery oil sludge by biodegradation in the soil is presently a partially defined process. This thesis is concerned with the development of methods to stimulate the rate and extent of petroleum biodegradation. The biodegradation of South Louisiana (SL) crude oil, and the effects of nitrogen, phosphorus and iron supplements on this process were compared in a polluted and in a relatively clean littoral seawater sample taken along the New Jersey coast. The optimal soil management practices for the disposal of waste oil sludges on land were determined in laboratory and field experiments. Various fertilizer formulations were tested in lysimeter columns for their effect on oil sludge biodegradation and leachate quality. An accidental pipeline break provided an opportunity to observe the effect of some of the developed management techniques in the large-scale rehabilitation of agricultural land. Dissert. Abstr.

N79-16389 Houston Univ., Tex.
ENVIRONMENTAL EFFECTS OF OFFSHORE OIL PRODUCTION Ph.D. Thesis
Brenda Pitts Basile 1978 289 p
Avail: Univ. Microfilms Order No. 7901184

Analytical methodology for the quantitation of alkanes, aromatic hydrocarbons, and sulfur was developed and was applied to the study of the environmental effects of offshore oil production. Completely deuteriated walkanes are separated from the corresponding unlabelled alkanes and serve as internal standards for the quantitation of environmental alkanes by gas chromatography alone. This technique provided a detection limit of 50 ng/l for hydrocarbons in seawater and 100 ng/g for hydrocarbons in sediments and in biological samples. The major conclusions from this study are: (1) There is petroleum contamination of water in this area of the Gulf of Mexico, but beyond 0.2 km of the production platform, this contamination cannot be ascribed to Buccaneer oilfield production activities. (2) Biota and sediments outside of the immediate vicinity of the production platforms do not contain petroleum hydrocarbons. This is especially important since this could affect the commercial fishing industry in the area. Dissert. Abstr.

N79-16390 Arizona State Univ., Tempe.
ADSORPTION OF CADMIUM AND LEAD BY INORGANIC STREAM SEDIMENT COMPONENTS Ph.D. Thesis
Steven Lee Fedder 1978 315 p
Avail: Univ. Microfilms Order No. 7900022

The role and importance of inorganic adsorption processes in controlling dissolved trace metal concentrations in natural waters was examined. An extensive literature review of clay, manganese dioxide and ferric hydroxide geochemistry and adsorption characteristics is presented. Emphasis was placed on the adsorption of divalent lead and cadmium by these adsorbents. Cadmium and lead geochemistry was detailed. Adsorption of these cations by clay minerals was not dealt with experimentally here. Adsorption of divalent lead and cadmium by hydrous manganese dioxide and aqueous ferric hydroxide suspensions was measured as a function of pH and six metal ion concentrations in a 0.01N NaNO3 matrix. Flameless atomic absorption spectrometry was employed for lead and cadmium determinations. Data are shown to conform to the Langmuir adsorption model and maximum adsorption capacity values are calculated as a function of pH 4-9. Dissert. Abstr.

N79-16391# Energy Research and Development Administration, Washington, D. C.
WASTE MANAGEMENT OPERATIONS: SAVANNAH RIVER PLANT, AIKEN, SOUTH CAROLINA Final Environmental Impact Statement
Sep. 1977 724 p refs
(ERDA-1537) Avail: NTIS HC E08/MF E08; HC SOD

The actual and potential environment effects of waste handling and storage operations at a plant producing materials for nuclear weapons are assessed. Radioactive, nonradioactive, and thermal discharges are discussed as well as all wastes stored on site. The potential consequences of accidents in waste handling and storage systems are covered. The impact on the environment since plant start-up in 1952 is reported. The effects of current operations and planned improvements are examined with emphasis on the effects that the effluents cause beyond the present plant boundary. On site effects that relate to future land and stream use are also described. A.R.H.

N79-16392# Energy Research and Development Administration, Washington, D. C.
MANAGEMENT OF INTERMEDIATE LEVEL RADIOACTIVE WASTE, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE Final Environmental Impact Statement
Sep. 1977 313 p refs
(ERDA-1553) Avail: NTIS HC E05/MF E05; HC SOD

The shale fracturing process currently used for the disposal of radioactive waste solutions is described. Reasonable alternative techniques assessed include fixation in shale cement, fixation in glass, and cesium stripping. The facility requirements for their implementation and the potential environment effects of each technique are examined. The relationship between short term uses and long term productivity; state, local, or regional conflicts; and irreversible and irretrievable committments of resources are discussed. A cost benefit analysis is included. A.R.H.

N79-16393# World Meteorological Organization, Geneva (Switzerland).
BOUNDARY LAYER PHYSICS APPLIED TO SPECIFIC PROBLEMS OF AIR POLLUTION
1978 333 p refs Proc. of WMO Symp., Norrkoeping, Swed., 19-23 Jun. 1978
(WMO-510; ISBN-92-63-10510-3) Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

The symposium topics cover the dispersion of pollutants in and above the atmospheric boundary layer and the development of improved air pollution simulation models, particularly in the case of multisource emissions. Emphasis is given on boundary layer modelling applicable to air pollution dispersion, including urban boundary layer models. For individual titles, see N79-16394 through N79-16434.

N79-16394# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
DIFFERENT APPROACHES TOWARD PREDICTING POLLUTANT DISPERSION IN THE BOUNDARY LAYER, AND THEIR ADVANTAGES AND DISADVANTAGES
J. W. Deardorff *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 1-8 refs (For primary document see N79-16393 07-45)
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The advantages and disadvantages of the different basic approaches currently available on dispersion within the boundary layer, with emphasis upon situations for which certain assumptions may fail are reviewed. G.Y.

N79-16395# Ochanomizu Women's Univ., Tokyo (Japan).
DETAILED CONSIDERATIONS ON VERTICAL DIFFUSION FROM SOURCES MOVING NEAR THE GROUND
Jiro Sakagami *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 9-16 refs (For primary document see N79-16393 07-45)
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Contrary to pollutants emitted from industrial stacks, pollutants exhausted from cars are generally emitted near the ground and also, at the initial stage, are enrolled in a strongly turbulent region caused by the motion of the running cars. Formulas used in atmospheric diffusion measurements are presented. Some results of detailed observations from investigations of the diffusion patterns from running cars are also presented. G.Y.

N79-16396# National Meteorological Inst., Madrid (Spain).
DIFFUSION BY TURBULENCE OF PARTICLES THROUGH THE LOWEST BOUNDARY LAYERS OF THE EARTH'S ATMOSPHERE IN NEUTRAL CONDITIONS. APPLICATIONS TO PROBLEMS OF AIR POLLUTION
Manuel Palomares-Casado *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 17-22 refs (For primary document see N79-16393 07-45)
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In the lowest boundary layers of the earth's atmosphere or surface boundary layer the wind direction remains constant with height. In addition, under neutral conditions, the velocity profile is logarithmic with height. For analogy, a study about suspensions of particles in water, it is supposed that groups of uniform particles arriving at one of these surface boundary layers with very stable air above it limits the possibility of rising through it. The air masses in ascending movement, because of turbulence, drag more particles than in air of descending movement, considering the same turbulence. Equations are derived for aerodynamically smooth and rough terrain and are applied to problems of air pollution. G.Y.

N79-16397# Uppsala Univ. (Sweden). Dept. of Meteorology.
OBSERVATIONAL STUDIES OF THREE-DIMENSIONAL TEMPERATURE- AND WINDFIELDS IN UPPSALA
Roger Taesler *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 23-30 refs Sponsored in part by Natl. Swed. Council for Building Res., Swed. Board for Tech. Develop. and Swed. Natl. Sci. Res. Council (For primary document see N79-16393 07-45)
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An experimental study was carried out for the development and three-dimensional structure of the urban heat island and associated effects on air flow. The measuring program is briefly described. G.Y.

N79-16398# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
FEEDBACK BETWEEN RADIATIVELY INTERACTING POLLUTANTS AND THEIR DISPERSION IN THE URBAN PLANETARY BOUNDARY LAYER
R. Viskanta and T. L. Weirich *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 31-38 refs (For primary document see N79-16393 07-45)
(Grant EPA-R-803574)
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The urban heat island is created by activities of man, and the effects of this activity both directly and indirectly contribute to the modification of local weather and climate. A number of feedback mechanisms can also come into play as a result of the anthropogenic effects. The main objective of this work is to search for the primary feedback mechanisms between pollutants, temperature structure, and pollutant dispersion. To this end, an unsteady two-dimensional transport model is used to perform numerical experiments for stable meteorological conditions during summer and winter days modeling a typical midwestern city in the United States. The results of numerical simulations are summarized. G.Y.

N79-16399# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
PROGRESS IN RESEARCH ON TURBULENT FLOW
John C. Wyngaard *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 39-43 refs (For primary document see N79-16393 07-45)
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Some recent advances which have increased (or promise to increase) the understanding of turbulence are briefly reviewed. Only the three-dimensional variety of turbulence, found continuously in the planetary boundary layer, is covered. G.Y.

N79-16400# Atomic Energy Commission Research Establishment, Riso (Denmark).
THE EFFECT OF LOCAL TERRAIN IRREGULARITIES ON THE MEAN WIND AND TURBULENCE CHARACTERISTICS NEAR THE GROUND
Ernest W. Peterson, Niels E. Busch, N. O. Jensen, J. Hoejstrup, L. Kristensen, and E. L. Peterson *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 45-50 refs Prepared jointly with Oregon State Univ. (For primary document see N79-16393 07-45)
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The findings of a joint field program between the United States and Denmark are reviewed. The program was conducted at the Riso National Laboratory in Denmark for the purpose of testing existing models of flow over a change in surface roughness. This purpose was expanded towards the more general goal of improving the understanding of the effects of heterogeneities in the form of the underlying surface on the local mean wind and turbulence fields and what the implications are for the dispersal and diffusion of aerosols and gaseous materials near the ground. The findings are reviewed specifically as they relate to air pollution. G.Y.

N79-16401# Uppsala Univ. (Sweden). Dept. of Meteorology.
METEOROLOGY OF CITIES AS RELATED TO AIR POLLUTION DISPERSION
Ulf Hoegstroem *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 53-61 refs (For primary document see N79-16393 07-45)
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In order to accomplish goals in air pollution abatement strategy some detail needs to be known as to how pollutants emitted at various heights and locations in a city are being transported and diluted by the natural wind as modified by the presence of the city. A picture of the physical characteristics of urban atmosphere relevant to pollutant dispersion as it emerges today from measurements and from modeling work (numerical and physical) are given. Some observations of urban air pollution are discussed. Some of the general problems encountered in modeling dispersion in an urban environment are discussed. Areas where there is particular need for future research are indicated. G.Y.

N79-16402# British Columbia Univ., Vancouver. Dept. of Geography.
SURFACE HEAT FLUXES AND THE URBAN BOUNDARY LAYER
T. R. Oke *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 63-69 refs Sponsored in part by Natl. Res. Council of Can. and Can. Dept. of the Environment (For primary document see N79-16393 07-45)
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The results of studies designed to evaluate the energy balance of typical urban building-air volumes are presented. Three cities were studied: Montreal, P.Q., metropolitan Vancouver, B.C. (two sites) and Uppsala, Sweden. G.Y.

N79-16403# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
THE VARIABILITY OF THE HEAT FLUX AND MIXED LAYER DEPTH OVER ST. LOUIS, MISSOURI
Jason K. S. Ching, John F. Clarke, and James M. Godowitch *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 71-78 refs (For primary document see N79-16393 07-45)
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An extensive study of the urban boundary layer was conducted in the St. Louis environs. The time variation of the heat flux in

the surface boundary layer was measured in several land use areas via the eddy correlation technique and also derived for the urban scale from an evaluation of the enthalpy equation based on series of vertical temperature soundings through the urban planetary boundary layer by helicopter. Details of the spatial and temporal variation in the surface sensible heat flux and mixed layer growth are discussed in light of a rapidly dissipating urban heat island. Results of heat flux measurements averaged over the diurnal cycle are presented for different land use areas. G.Y.

N79-16404# San Jose State Univ., Calif. Dept. of Meteorology.

FRICTIONAL RETARDATION OF SEA BREEZE FRONT PENETRATION IN NEW YORK CITY AND ITS IMPLICATIONS FOR POLLUTANT DISTRIBUTION

R. D. Bornstein, P. H. Fontana, and W. T. Thompson *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 79-87 refs (For primary document see N79-16393 07-45)

(Grant ATM77-21467)

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The initiation, development, penetration, and dissipation of sea breeze fronts in New York City were studied using data collected during the NYU/NYC Urban Air Pollution Dynamics Project of 1964-69. Eight sea breeze cases during a twenty-day observational period from June 1965 are analyzed using hourly mesoscale flow charts. Preliminary results show a pattern in which the movement of the sea breeze front is slowed over the most built up part of the city. The effect of the marine air behind the front on the spatial distribution pattern of SO2 and on the temporal variation of SO2 at particular sites within the city are determined by comparing such patterns and variations on sea breeze and nonsea breeze days. Preliminary results show decreasing concentrations over the upwind half of the city associated with the passage of the sea breeze front, with increasing concentrations over the downwind half. G.Y.

N79-16405# Atmospheric Environment Service, Downsview (Ontario).

NUMERICAL MODELS OF THE BOUNDARY-LAYER WITH POTENTIAL APPLICATION TO AIR POLLUTION DISPERSION CALCULATIONS

P. A. Taylor *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 89-93 refs (For primary document see N79-16393 07-45)

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The difficulties of predicting the details of boundary layer air flow over cities or other areas of complex terrain through the use of numerical models are discussed. Particular attention is given to thermal effects, hydrodynamic effects of topography and surface roughness in numerical modeling. The applications of numerical models to diffusion studies are also discussed. G.Y.

N79-16406# Mitsubishi Heavy-Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.

NUMERICAL ANALYSIS OF GAS DIFFUSION OVER A MOUNTAIN IN THERMALLY STRATIFIED FLOW

Hiroki Okamoto and Ryohji Ohba *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 97-104 refs (For primary document see N79-16393 07-45)

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Plume rise, atmospheric stability and topographical profile are important factors in the control of gas diffusion in the atmosphere. A numerical model to calculate gas diffusion around a two-dimensional obstacle in thermally stratified flow is presented. The computer code is based on the FDM, called the Marker and Cell (MAC) method which is a multiuse program developed for the calculation of flow pattern. The original MAC method was expanded so as to calculate the heat and mass diffusion around an oblique boundary. It is concluded through this study that it is necessary to take consideration of an advective effect in addition to a diffusive effect in order to predict gas diffusion concentration over a complex terrain in nonneutral stability. G.Y.

N79-16407# Atmospheric Environment Service, Downsview (Ontario).

PROGRESS IN THE DEVELOPMENT OF A THREE-DIMENSIONAL BOUNDARY-LAYER MODEL APPLICABLE TO URBAN AND REGIONAL SCALE AIR POLLUTION DISPERSION

John L. Walmsley *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 105-114 refs (For primary document see N79-16393 07-45)

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In order to model adequately actual situations of air pollution and dispersion, it is necessary to have available a boundary layer model that produces good representation of wind and turbulence fields. The results from a three-dimensional meteorological model can be used to evaluate dispersion, assuming a pollutant which does not interact with the flow. In the hydrostatic model described, the lower limit of horizontal scales is approximately 3 km. The upper limit is assumed to be of order 100 km. These scales imply grid spacings somewhat smaller, approximately 1-20 km. Detailed monitoring of mass and total energy conservation is incorporated. The model atmosphere is presently assumed to be dry and neutrally stratified to permit concentration on model dynamics. Closure of the equations of motion is achieved by K-theory. This could be replaced by addition of a turbulent energy equation. G.Y.

N79-16408# National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Atmospheric Turbulence and Diffusion Lab.

A REVIEW OF THE INFLUENCE OF NEW BOUNDARY LAYER RESULTS ON DIFFUSION PREDICTION TECHNIQUES

Steven R. Hanna *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 119-126 refs (For primary document see N79-16393 07-45)

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Techniques commonly used to estimate diffusion in the boundary layer remain at nearly the same stage of development they were at over ten years ago. However, a revolution is underway in which the new boundary layer findings are being applied to diffusion calculations. Much of this new work is still underway and is available only in preliminary reports. The purpose of this brief summary is to review these major new developments in diffusion theory. G.Y.

N79-16409# Abcor, Inc., Wilmington, Mass. Walden Div.

VALIDATION OF DISPERSION COEFFICIENTS FOR MODELING ELEVATED SOURCES IN THE INTERNAL BOUNDARY LAYER OF COASTLINE ENVIRONMENTS

Peter H. Guldberg *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 127-134 refs Sponsored in part by North. Ind. Public Serv. Co. of Hammond (For primary document see N79-16393 07-45)

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A study of two contemporary multisource models was performed to identify the accuracy of each in representing the general characteristics of complex dispersion processes on the thermal internal boundary layer of coastal environments. The two models tested were RAM (urban version) and PTMTP (terrain version), which are similar with the exception of assumed atmospheric dispersion rates. The models were tested in a comprehensive validation at sites along the Lake Michigan shore in northern Indiana. The results indicated that: (1) both models are conservative; and (2) the model concentration estimates produced by PTMTP are much more accurate than those produced by RAM, for the coastal environment. G.Y.

N79-16410# Institut Royal Meteorologique de Belgique, Brussels.

METEOROLOGICAL FACTORS AND AIR POLLUTION INDEX

L. M. Malet and A. Joukoff *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 135-141 refs (For primary document see N79-16393 07-45)

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Since the beginning of 1968, each of the five great urban

agglomerations of Belgium disposes of a semiautomatic network of more or less 25 stations measuring the 24 h mean concentration of SO2 and particulate matters in the air. A fully automatic network dealing with the continuous control of the air quality is to be used in each of the areas. The Royal Meteorological Institute is to take charge of issuing short term (24 h) forecasts of the air quality based on the situation as regards SO2 considered as a good indicator of global air pollution. An attempt is made to develop a global air pollution index based both on a certain number of meteorological parameters and on measured pollution itself. G.Y.

N79-16411# Central Research Inst. of Electric Power Industry, Tokyo (Japan).

SIMULATION METHOD FOR MULTIPLE SOURCE DIFFUSION WITH CORRECTION FACTORS RELATING TO THE SCALE OF THE SOURCE

Hiroshi Shikata and Kazuo Asakura *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 143-149 (For primary document see N79-16393 07-45)

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Two examples of simulation calculations being applied to two different industrial cities in Japan are shown in the following: one is in Kashima district where there are few small scale SO2 sources; the other is a Toyama district where a number of small scale sources are widely distributed. In the latter case, which includes many uncertain factors, a method is described whereby results of simulation are corrected by introducing correction factors deduced from a method of indeterminate coefficients. G.Y.

N79-16412# Israel Meteorological Service, Bet Dagan. Research and Development Div.

ON RESOLVING THE RELATIVE CONTRIBUTION OF AN ELEVATED SINGLE SOURCE TO THE SURFACE CONCENTRATION FIELD IN AN URBAN AREA

A. Manes and M. Rindsberger *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 151-156 refs (For primary document see N79-16393 07-45)

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Urban dispersion models of varying complexity were designed to predict the surface concentration field, given the distribution of sources and their respective strength as well as meteorological conditions. An attempt is made to resolve the relative contribution of a single elevated source to the observed SO2 surface concentration by applying harmonic analysis to the diurnal patterns of pollutant concentration. The single elevated source is a 550MW oil fired power plant located at the outskirts of Tel-Aviv. The other sources are typical of a metropolitan area. G.Y.

N79-16413# Royal Netherlands Meteorological Inst., De Bilt.

A SIMPLE METHOD FOR QUICK ESTIMATES OF FREQUENCY DISTRIBUTIONS OF AIR POLLUTION CONCENTRATIONS FROM LONG-TERM AVERAGE CONCENTRATIONS

G. J. Cats *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 157-162 refs (For primary document see N79-16393 07-45)

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Poor correlations between calculated and measured concentrations suggest that the Gaussian plume model must not be used to calculate 98 percentiles. A procedure is defined to estimate 98 percentiles, when the long-term average concentration of air pollution is known as a function of wind direction. The contribution of planned sources to the long-term average concentration can be estimated as a function of wind direction with the Gaussian model plume model. Therefore, the procedure allows the prediction of the change of the 98 percentile due to the introduction of the planned sources, without Gaussian plume model calculations of higher percentiles. The validity of the assumptions and simplifications was tested on data sets, which was obtained in industrial and urban areas.G.Y.

N79-16414# Mitsubishi Heavy-Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.

SHEAR FLOW CORRECTION FOR GAUSSIAN PLUME MODEL

Nobuhiro Ukeguchi and Yasuo Ide *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 163-168 refs (For primary document see N79-16393 07-45)

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Air pollution due to nitrogen dioxide (NO2) is studied. Considering a mobile source of vehicular emission as a continuous point one and assuming power-law forms for wind speed and diffusivities in the surface boundary layer, the shear flow correction for the Gaussian plume model is obtained, which can tell a determining height for a constant wind speed in the model and how the ground level concentration should be modified. The effect of atmospheric stability on diffusion in the shear flow is discussed. S.E.S.

N79-16415# Universite Catholique de Louvain (Belgium). Inst. d'Astronomie et de Geophysique Georges Lemaitre.

SENSITIVITY ANALYSIS OF A GAUSSIAN PLUME MODEL

C. Legros and A. L. Berger *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 169-174 refs (For primary document see N79-16393 07-45)

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Plume rise, stack height, and diffusion parameters were found to be very sensitive. Wind speed, mixing height were proved to be moderately sensitive. The ambient air temperature and the initiation of homogenization throughout the mixing layer were determined unsensitive. S.E.S.

N79-16416# Atmospheric Environment Service, Downsview (Ontario).

ATMOSPHERIC BOUNDARY LAYER EFFECTS ON THE DISPERSION OF TALL STACK PLUME

F. H. Fanaki *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air pollution 1978 p 175-183 refs (For primary document see N79-16393 07-45)

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Selected plume rise and diffusion models and their limitations in describing the tall-stack plume are presented. The effect of different meteorological conditions that affect the dispersion and behavior of the plume is investigated. Field studies of plume dispersion from a 381 meter stack are discussed. The experimental site and the stack characteristics are described. S.E.S.

N79-16417# Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).

PLUME RISE AND THE VERTICAL WIND SHEAR

Nadezda Sinik *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 185-188 refs (For primary document see N79-16393 07-45)

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Theoretical speculations on the mechanical influence of the wind velocity vertical shear upon plume rise is discussed. Plume measurements indicate the importance to complete the wind data in any of the plume rise formulae with vertical wind shear measurements above the stack top. S.E.S.

N79-16418# Central Electricity Research Labs., Leatherhead (England).

DIFFUSION FROM A TALL STACK IN A DEVELOPING BOUNDARY LAYER

B. E. A. Fisher *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 189-196 refs (For primary document see N79-16393 07-45)

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The measurements for one day are analyzed with the aim of seeing how far a model can predict hourly average SO2 concentrations in the vicinity of a power station on a specific occasion. The day chosen was one when convective effects produced by daytime heating of the atmospheric boundary layer were important. The time dependent behavior of the boundary layer and its effect on dispersion are discussed. A multi-source diffusion model for estimating hourly average concentrations from power stations, industrial and urban sources is described. S.E.S.

N79-16419# Meteorological Dept., New Delhi (India).
SOME PROBLEMS ASSOCIATED WITH DISPERSION OF POLLUTANTS FROM A REFINERY
B. Padmanabhamurty and R. N. Gupta *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air pollution 1978 p 197-204 refs (For primary document see N79-16393 07-45)
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The increase in concentration under fumigation conditions was determined and compared with air quality standards to assess the quality of air around and downwind of oil refineries. Plumes from single and multiple stacks are studied due to the sulfur dioxide emissions. Ground level short term concentrations along the center plume lines are provided by Gaussian distribution equations. S.E.S.

N79-16420# Stockholm Univ. (Sweden). Dept. of Meteorology
ESTIMATE OF WET DEPOSITION OF POLLUTANTS AROUND A POINT SOURCE
Henning Rodhe *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 205-210 refs (For primary document see N79-16393 07-45)
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A few simple ways of modeling the long term distribution of wet deposition around a continuously emitting point source as a function of the distance from the source are formulated and discussed. Numerical values of the scavenging coefficient are used to illustrate the differences between the different models. S.E.S.

N79-16421# Oslo Univ. (Norway). Inst. of Geophysics.
MODELLING OF SECONDARY POLLUTANTS: ESTIMATES OF OZONE AND PARTICULATE SULFUR FORMATION IN POLLUTED AIR
Ivar S. A. Isaksen and Oeystein Hov *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 211-218 refs Sponsored by Norweg. Res. Council for Sci. and the Humanities (NAVF) (For primary document see N79-16393 07-45)
Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

The mechanisms responsible for generation of ozone during pollution episodes are established. Anthropogenic release of nitrogen oxides and hydrocarbons in connection with solar radiation is measured. S.E.S.

N79-16422# Oslo Univ. (Norway). Inst. of geophysics.
A NUMERICAL METHOD TO PREDICT SECONDARY AIR POLLUTANTS WITH AN APPLICATION ON OXIDANT GENERATION IN AN URBAN ATMOSPHERE
Oeystein Hov, Ivar S. A. Isaksen, and Eigil Hesstvedt *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 219-226 refs Sponsored by Norweg. Res. Council for Sci. and the Humanities (NAFV) (For primary document see N79-16393 07-45)
Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

A model for the prediction of secondary air pollutants is presented. A chemical exchange between a large number of species which take place with time constants ranging from fractions of a second to several days or even longer is described. A simultaneous interaction with atmospheric transportation processes is surveyed. The solution of the mathematical system which arises must be found or approximated. A chemical development is described by means of a set of ordinary differential equations (ODE's). S.E.S.

N79-16423# Swedish Meteorological and Hydrological Inst., Stockholm.
SOME AIR POLLUTION MODELLING WORK IN SWEDEN
Bjoern Bringfelt *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 227-230 refs (For primary document see N79-16393 07-45)
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The air pollution modelling of the Swedish Meteorological and Hydrological Institute is devoted to practical application. Some models are already in practical use and others are being developed. The following models are described: (1) Gaussian point source model; (2) multiple source city model; (3) model of carbon monoxide from street traffic; (4) mesocale model for diffusion, chemical transformation and deposition (K-model) S.E.S.

N79-16424# Atmospheric Environment Service, Downsview (Ontario).
A SIMILARITY MODEL FOR MAXIMUM GROUND LEVEL CONCENTRATION IN A FREELY CONVECTIVE ATMOSPHERIC BOUNDARY LAYER
Bryan R. Kerman *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 231-239 refs (For primary document see N79-16393 07-45)
Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

Estimates of downwind concentration resulting from buoyant emissions are presented. The effective height of rise of the plume is determined. The surface concentration statistics, assuming the plume's cross-section to be Gaussian, are computed. A model which combines these aspects naturally within an alternative conceptualization of plume rise and spreading, which in turns leads to further insight into the intrinsic diffusion structure is developed. S.E.S.

N79-16425# Environmental Research and Technology, Inc., Concord, Mass.
ASSESSING AIR QUALITY LEVELS IN REGIONS OF MOUNTAINOUS TERRAIN
Bruce A. Egan, R. d'Errico, and C. Vaudo *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 241-247 refs (For primary document see N79-16393 07-45)
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A Gaussian model for use in estimating peak ground level pollutant concentrations in evaluated terrain is described. Stable atmospheric conditions are discussed. S.E.S.

N79-16426# Meteorological Office, Bracknell (England).
THE INFLUENCE OF TOPOGRAPHY ON POLLUTION DISPERSAL
P. J. Mason *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 249-256 refs (For primary document see N79-16393 07-45)
Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

Large scale numerical models which include wind speed effects and parameterisation of topography are presented. Laminar flows and turbulent flow on an atmospheric scale were examined. A solution of the Navier-Stokes equation with the viscosity set equal to a constant value of eddy viscosity in atmospheric boundary layer is developed. S.E.S.

N79-16427# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
THE IMPLICATIONS OF REMOTE-SENSING DEVELOPMENTS FOR AIR-POLLUTION METEOROLOGY
William H. Hooke *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 259-270 refs (For primary document see N79-16393 07-45)
Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

The implications of recent progress for air pollution meteorology are reviewed. Remote sensing as it is being applied to research problems in urban meteorology, the planetary boundary layer (PBL), and turbulence diffusion processes is discussed. The use of remote-sensing data as inputs for initializing and verifying numerical models, on the transfer of remote-sensing data as inputs for initializing and verifying numerical models, on the transfer of remote-sensing technology into the operational sector, and on future uses in the operational air-pollution forecasting is examined. The two basic approaches to atmospheric measurement in situ instrumentation and remote sensors were compared. S.E.S.

N79-16428# Humboldt Univ., Berlin (East Germany). Bereich Meteorologie und Geophysik.

SOME RESULTS OF LOWER TROPOSPHERE INVERSION STATISTICS IN MIDDLE EUROPE

K. Bernhardt, A. Helbig, H. Kettner, M. Olberg, and I. Thees *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 271-277 ref (For primary document see N79-16393 07-45)

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Temperature inversions acting as barrier layers for turbulent exchange are presented. The annual variation of surface inversion frequency is demonstrated. A model of inversion persistence by stochastic process is developed. S.E.S.

N79-16429# Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).

DIFFUSIVITY POTENTIAL OF BAKAR'S BAY

Edita Loncar *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 279-285 refs (For primary document see N79-16393 07-45)

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Various types of industry with respect to emissions, emissions heights and amounts, and the emission sources locations were developed in the region of Bakar's bay. The local climatology of this region is influenced by the sea, by an abundance of natural bay, by the form of a deep bay with steep beach sides, and by the complicated nearest inland orography. The stability and wind flow were studied as a basis of the pollutants dispersion calculation at various levels. A correlation between the most probable temperature profiles and the most probable wind direction was examined. S.E.S.

N79-16430# Staatliches Amt fuer Atomsicherheit und Strahlenschutz (East Germany).

DISPERSION OF POLLUTANTS IN A STRATIFIED ATMOSPHERE

Helga Zindler *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 287-293 refs (For primary document see N79-16393 07-45)

Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

The models describing the dispersion and dilution of plumes were developed. The dispersion of airborne material from point sources by way of the statistical theory of turbulent diffusion is calculated. The model of the statistical theory of turbulent diffusion is based on the assumption that it is only possible to predicate the probable distribution of a large group of particles. Layers with increasing temperature, and temperature inversion were studied. S.E.S.

N79-16431# Norwegian Meteorological Inst., Blindern.

A REVIEW OF SYNOPTIC SCALE TRANSPORT MODELLING

Anton Eliassen *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 295-302 refs (For primary document see N79-16393 07-45)

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Advection, Eulerian, and Lagrangian models are reviewed. Most models were applied to the transport of sulfur compounds. The wind field is obtained from the analysis of measured wind directly and indirectly. Deposition and chemical transformations of boundary layers are discussed. S.E.S.

N79-16432# Royal Netherlands Meteorological Inst., De Bilt.

LONG-RANGE AND INTERREGIONAL TRANSPORT OF SO2 TOWARDS THE NETHERLANDS DURING EXTREMELY UNFAVORABLE METEOROLOGICAL CONDITIONS. CASE STUDY OF THE EPISODE 27-30 JANUARY 1976

J. F. Dentonkelaar *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 303-307 refs (For primary document see N79-16393 07-45)

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Evidence that in adverse meteorological conditions the air pollution concentration pattern in the Netherlands is strongly affected by inter-regional transport across national boundaries is presented. The changing meteorological phenomena in different concentration levels caused by external sources is discussed. Unfavorable meteorological conditions caused mainly by SO2 concentrations in inter-regional or long-range transport are studied. The direction of the inter-regional transport is correlated with wind speed and wind direction. S.E.S.

N79-16433# Central Research Inst. of Electric Power Industry, Tokyo (Japan).

INVESTIGATION OF ORIGIN OF HIGH LEVEL OZONE OXIDANT IN A COASTAL AND NONURBAN AREA IN JAPAN

Hiroshi Shikata, Yoshinbu Kabe, and Momotsuga Ohnishi (Shikoku Elec. Power Company, Takamatsu, Japan) *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 309-314 (For primary document see N79-16393 07-45)

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In high pressure weather systems from spring to autumn, the daily maximum of 1-hour-averaged concentrations always exceed 8 pphm. Concentrations of nitrogen oxide and non-methane hydrocarbon that play important roles in the photochemical reaction, are very low. The concentration of formaldehyde, which is produced in the process of the photochemical reaction with ozone, are always low, too. Analysis of trajectories of arriving air masses indicates that direct transport of polluted air from a large urban industrial zone does not necessarily cause high levels of ozone/oxidant. The patterns of regional distribution of high ozone concentration similar to those reported in the United States and Europe, occur around Japan in high pressure systems are discussed. S.E.S.

N79-16434# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.

ON THE IMPORTANCE OF THE VERTICAL STRUCTURE OF THE BOUNDARY LAYER IN MODELLING THE LONG RANGE TRANSPORT FOLLOWING AN ACCIDENTAL RELEASE OF POLLUTANT

H. M. ApSimon, D. Earnshaw, A. J. H. Goddard, and J. Wrigley *In* WMO Boundary Layer Phys. Appl. to Specific Probl. of Air Pollution 1978 p 315-322 refs Sponsored by EURATOM-CEA (For primary document see N79-16393 07-45)

Copyright. Avail: NTIS HC A15/MF A01; WMO, Geneva Sw. Fr. 35

A simple model to illustrate the role of the boundary layer is developed. The model is used in a few hypothetical situations to describe, for example, how the height and time of release affect the flux of pollutants surviving the first 100 km through changing patterns of mixing layer depth, and how time integrated ground level concentrations and depostion are affected by diurnal cycles of the boundary layer. The important features of the boundary layer are incorporated in to the model. A computer program with real meteorological data from synoptic stations and ship data was designed. S.E.S.

N79-16435# Research Inst. for Environmental Hygiene, TNO, Delft (Netherlands). Atmospheric Pollution Div.

DETERMINATION OF FLUORIDES

F. J. W. Kommers Sep. 1976 11 p refs

(IG-TNO-G-748) Avail: NTIS HC A02/MF A01

Some methods for determining fluorides in ambient air and plant material are discussed. A method using impregnated filter paper for sampling fluorides in air is described. Fluorides in grass and other plant material were sampled by bringing the fluorides in solution and measuring their concentration in liquid samples using a fluoride ion selective electrode and diluted fluoride standard. ESA

N79-16436# GCA Corp., Bedford, Mass. GCA Technology Div.

EVALUATION OF MOTOR VEHICLE EMISSIONS INSPECTION AND MAINTENANCE PROGRAMS IN WISCONSIN Final Report

Theodore P. Midurski, Lee A. Coda, Robert O. Phillips, Nancy K. Roy, and Frederick M. Sellars Sep. 1978 216 p refs

(Contract EPA-68-02-2607)

(PB-287070/7; GCA-TR-78-38-G) Avail: NTIS HC A10/MF A01 CSCL 13B

Recent data for the State of Wisconsin indicates that the

National Ambient Air Quality Standards for CO and O(x) will not be attained in all areas of the state by 1982, even if all reasonably available control technologies are applied. In view of this, it is likely that the state will request from EPA an extension of the compliance date beyond 1982. In order for this request to be considered, the state must, among other things, have adopted a firm schedule for implementing a motor vehicle inspection and maintenance (I/M) program in the highly urbanized nonattainment areas. In this connection, the State of Wisconsin is currently in the initial states of planning for the implementation of an I/M program. As part of this initial effort, several candidate program configurations have been analyzed from the standpoint of costs, benefits, and other requirements. These analyses, which are reported herein, will provide the basis for the state to select one specific option that will eventually be implemented. GRA

N79-16437# California Univ., Santa Barbara. Marine Science Inst.

OIL POLLUTION REPORTS, VOLUME 5, NUMBER 2 Quarterly Report, Feb. - May 1978

Helmut Ehrenspeck, Elizabeth Sorenson, Jim Cook, and Barbara Searles Aug. 1978 256 p refs

(Grant EPA-R-805052)

(PB-287071/5; EPA-600/7-78-160-Vol-5) Avail: NTIS HC A12/MF A01 CSCL 13B

A quarterly compilation of abstracts of current oil pollution-related literature, research projects, and conferences is presented. Comprehensive coverage of terrestrial and aquatic oil pollution and its prevention and control is provided, with emphasis on the marine environment. Citations and summaries of 1975 to 1978 scientific and technical publications, and patents; status and summaries of current research programs; and information on current meetings are given. GRA

N79-16438# Cameron Engineers, Inc., Denver, Colo.

MULTIMEDIA ENVIRONMENTAL CONTROL ENGINEERING HANDBOOK: METHODOLOGY AND SAMPLE SUMMARY SHEETS Final Task Report, Dec. 1976 - Aug. 1978

T. C. Borer and A. W. Karr Sep. 1978 282 p

(Contract EPA-68-02-2152)

(PB-287178/8; EPA-600/7-78-187) Avail: NTIS HC A13/MF A01 CSCL 13B

A development methodology and sample summary sheets for a Multimedia Environmental Control Engineering Handbook are presented. The environmental effects of many industrial processes (including those involving fossil fuels) are examined to determine where environmental controls are needed and, if needed, which existing controls are applicable or may have to be developed. Each main classification of the Handbook is subdivided to specific devices or processes. The summary sheet includes appropriate identification, pollutants controlled, process description, application range, capital costs, operating costs, operating efficiencies, environmental problems, special notes, manufacturers/suppliers, and references. GRA

N79-16439# Research Triangle Inst., Research Triangle Park, N. C.

COMPILATION OF LEVEL 1 ENVIRONMENTAL ASSESSMENT DATA Final Report, Sep. 1977 - Jun. 1978

N. H. Gaskins and F. W. Sexton Oct. 1978 504 p refs

(Contract EPA-68-02-2156)

(PB-286924/6; EPA-600/2-78-211) Avail: NTIS HC A22/MF A01 CSCL 13B

The data are organized within each study by the analytical technique used to generate them. Each study is summarized, followed by the data generated in that study. The studies are organized by industrial type: chemically active fluidized bed combustor, coal-fired boiler, coal-fired power plant, new energy source, coke production, electric arc furnace, fluidized bed combustor, home heater multi-source source, ocean incinerator, oil burner, and textile. The report documents sampling and analytical techniques that were used which are not specified in Level 1. It also includes trends and anomalies that were detected in the 19 studies. GRA

N79-16440# Oklahoma Water Resources Research Inst., Stillwater.

PREDICTION OF ASSIMILATION CAPACITY IN SMALL RECEIVING STREAMS Final Report, 1 Jul. 1975 - 30 Jun. 1978

Don F. Kincannon, A. F. Gaudy, Jr., Edward R. Stapley, and Richard N. Devries Jun. 1978 92 p refs

(Contract DI-14-34-0001-8038)

(PB-286984/0; W78-12604; OWRT-A-063-OKLA(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

The usual procedure for predicting or estimating the assimilation capacity of a receiving stream involves application of the Streeter-Phelps Equation. However, such prediction has not provided sufficiently accurate estimates of the assimilation capacity. Previous laboratory research had indicated that if an open jar technique is used to replace the BOD bottle technique for obtaining the O2 utilization curve, the DO profile in the receiving stream can be more accurately predicted. A section of Black Bear Creek located in Noble and Pawnee Counties, Oklahoma was used to evaluate the open jar technique. Reaeration characteristics were estimated from the physical characteristics of the stream. O2 uptake data were determined by the open jar technique. A DO profile was predicted for a particular situation. A known waste water was introduced into Black Bear Creek and the resulting DO profile was measured. GRA

N79-16441# Purdue Univ., Lafayette, Ind. Water Resources Research Center.

FLOW OF KAOLINITE AND SEWAGE-SLUDGE SUSPENSIONS IN SAND-SILT POROUS MEDIA

Robert L. Uebler and Dale Wartzendruber Aug. 1978 99 p refs Sponsored by the Dept. of Interior

(PB-286985/7; TR-113; W78-12606; OWRT-A-034-IND(1)) Avail: NTIS HC A05/MF A01 CSCL 13B

Land disposal of municipal sludge is a practice utilized for many years, but only recently is it being considered on a large scale. A potential problem is the physical clogging of the soil pores after extended sludge application. Movements of two water suspensions, kaolinite clay and sewage sludge into two sand-silt mixtures were studied by dual-energy gamma-ray attenuation. Equations were developed to describe the increase of suspension-particle bulk density at a given position in the sand-silt column and also the reduction in hydraulic conductivity, with cumulative volume of outflow from the column. The capability of these equations for describing the observed experimental results was tested by nonlinear least squares regression. The clogging coefficient appeared to be reasonably related to such factors as particle size and initial water content of the porous medium, and to the nature of the applied suspension. GRA

N79-16442# Research Triangle Inst., Research Triangle Park, N. C.

STATUS OF IERL RTP ENVIRONMENTAL ASSESSMENT METHODOLOGIES FOR FOSSIL ENERGY PROCESSES Final Report, Jul. 1977 - Jun. 1978

John L. Warren Jul. 1978 108 p refs

(Contract EPA-68-02-2612)

(PB-287210/9; EPA-600/7-78-151) Avail: NTIS HC A06/MF A01 CSCL 13B

The report summarizes the status of the following environmental assessment (EA) methodologies: (1) current process technology background, (2) environmental data acquisition, (3) current environmental background, (4) environmental objectives development, (5) control technology assessment, and (6) environmental alternatives analysis. After discussing the mechanism used to prepare the report, it reviews the need for additional research in: (1) basic research, (2) analytical methods, (3) environmental models, and (4) multimedia environmental goals. It suggests improvement in contractor/EPA coordination, coordination of EA methodology development with health effects research, multimedia environmental goal coordination, dissemination of results, and interaction with other agencies. It includes a bibliography of all published reports and drafts of IERL-RTP's EA methodology program. GRA

N79-16443# PEDCo-Environmental, Inc, Cincinnati, Ohio.

EPA UTILITY FGD SURVEY: FEBRUARY - MARCH 1978

N. Gregory, G. Isaacs, B. Laseke, M. Melia, and A. Patkar Jun. 1978 100 p

(Contract EPA-68-01-4147)

(PB-287214/1; EPA-600/7-78-051B) Avail: NTIS HC A05/MF A01 CSCL 13B

A survey is presented of utility flue gas desulfurization (FGD) systems in the U.S. A summary is given of information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms. Systems are tabulated alphabetically, by development status (operational, under construction, in planning stages, or terminated operations), by utility company, by process supplier, by process, by waste disposal practice, and by regulatory class. Data are presented on system design, fuel sulfur content, operating history, and actual performance. It discusses problems and solutions associated with the boilers and FGD systems. Process flow diagrams and FGD system economic data are appended to the report. GRA

N79-16444# Palmer (C. Mervin), Kennett Square, Pa.

ALGAE AND WATER POLLUTION Final Manual, 1973 - 1976

C. Mervin Palmer Dec. 1977 133 p refs

(Contract EPA-68-03-0232)

(PB-287128/3; EPA-600/9-77-036) Avail: NTIS HC A07/MF A01 CSCL 13B

A simplified identification key limited to algal species of importance in water supplies and associated with pollution is presented. The most important species are illustrated in three-dimensional drawings in color. The ecology and significance of algae is covered. Information on filter clogging and mat forming algae, attached forms, algicides and algal control, algae associated with pollution (both fresh water and estuarine), various uses of algae, algae of rivers and lakes, eutrophication, algae as indicators of pollution, methods of recording algae, and the use of algae in waste stabilization lagoons for the treatment of domestic and/or industrial wastes is presented. GRA

N79-16445# General Accounting Office, Washington, D. C. Community and Economic Development Div.

AN EXECUTIVE SUMMARY: 16 AIR AND WATER POLLUTION ISSUES FACING THE NATION Report to the Congress.

11 Oct. 1978 45 p refs

(PB-287197/8; CED-78-148A) Avail: NTIS HC A03/MF A01 CSCL 13B

Controlling air and water pollution could cost the Government and Industry $423 billion from 1975 to 1984. Officials in the public and private sectors are raising questions such as: how much environmental protection is needed, when is it needed, what is the best way of getting it, and what price is the nation willing to pay. With these thoughts in mind, GAO studied national air and water pollution control goals and stategies to determine strengths and weaknesses and to identify possible alternatives. During its study, GAO identified 16 major environmental pollution issues, performed extensive fieldwork, expressed its view on each issue, and recommended congressional and agency action, where appropriate. GRA

N79-16446# Catalytic, Inc., Charlotte, N. C.

ENVIRONMENTAL ASSESSMENT FOR RESIDUAL OIL UTILIZATION Annual Report, May 1977 - May 1978

M. F. Tyndall, F. D. Kodras, J. K. Puckett, R. A. Symonds, and W. C. Yu Sep. 1978 183 p refs

(Contract EPA-68-02-2155)

(PB-286982/4; EPA-600/7-78-175; AR-2) Avail: NTIS HC A09/MF A01 CSCL 13B

Progress in an environmental assessment of processes using residual oil for electric power generation is reported. Emissions data from the literature and preliminary sampling are presented with material balances and flow diagrams for hydrodesulfurization, flue gas desulfurization, partial oxidation, and chemically active fluid bed processes. A computer program for a theoretical engineering analysis that will provide emissions output for the processes studied is described. Multimedia Environmental Goals (MEGs) and Minimum Acute Toxicity Effluents (MATEs) are used to develop pollutant prioritization and source analysis models. Methods for developing economic cost models are described. GRA

N79-16447# Environmental Monitoring and Support Lab., Cincinnati, Ohio.

EVALUATION OF THE US GEOLOGICAL SURVEY LABORATORY, ATLANTA, GEORGIA

Robert L. Booth Jul. 1978 20 p

(PB-286706/7; EPA-600/7-78-137) Avail: NTIS HC A02/MF A01 CSCL 07D

An on-site evaluation was made of the capabilities of the U.S. Geological Survey Laboratory at Atlanta, Georgia. Particular emphasis was placed on determining their ability to meet the monitoring requirements connected with their contractual efforts with the U.S. Environmental Protection Agency. This monitoring is a major part of the Environmental Protection Agency's quality assurance program in support of energy-related activities in the eastern United States. Overall, water analyses for parameters related to the broad areas of chemistry, organics and pesticides, and aquatic biology are being conducted by approved sampling/preservation techniques and laboratory methods. Specific recommendations for areas of improvement are given. GRA

N79-16448# Ohio State Univ., Columbus. Water Resources Center.

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME 1: PRESERVING THE STATISTICAL STRUCTURE IN LAKE TRANSPORT CALCULATIONS

K. W. Bedford, R. W. Sykes, and C. Babajimopolous 31 May 1978 243 p refs

(OWRT Proj. A-039-Ohio(1); OWRT Proj. A-063-Ohio(2))

(PB-286391/8; OSU-527X-Vol-1; W78-11863;

OSU/CE-5/78/5) Avail: NTIS HC A11/MF A01 CSCL 13B

Turbulence so seriously affects the transport of pollutants that a study was undertaken to derive and implement a lake circulation and pollutant transport model which preserves the detailed spectral structure of the turbulent fluctuation during computations made with a coarse grid work. The three dimensional rigid lid, shallow water wind driven governing equations include inertial effects but exclude thermal stratification. A spatial filtering technique derived and applied to the equations and a time splitting formulation of the pressure and velocity equations was derived. Source sink terms for the transport equations were formulated from simple first order kinetics. The results indicate that for a stochastically correct wind shear a fully three dimensional turbulence structure will never be possible within rigid lid lake models. GRA

N79-16449# Ohio State Univ., Columbus. Water Resources Center.

THE TURBULENT TRANSPORT AND BIOLOGICAL STRUCTURE OF EUTROPHICATION MODELS. VOLUME 2: COMPARATIVE STUDY OF THE MATHEMATICAL FORMULATIONS FOR PRIMARY PRODUCTIVITY IN STRATIFIED LAKES

R. M. Sykes, K. W. Bedford, and K. M. Smarkel 31 May 1978 227 p refs

(OWRT Proj. A-039-Ohio(2); OWRT Proj. B-063-Ohio(2))

(PB-286392/6; OSU-527X-Vol-2; W78-11864;

OSU/CE-5/78/6) Avail: NTIS HC A11/MF A01 CSCL 13B

The ability of existing eutrophication models to reproduce high density spatial and temporal field data was tested in order to determine the minimal structural complexity needed in such models. Structural components studied included oxygen, benthal deposits, dissolved and suspended organic matter, nutrients, light, temperature, vertical thermal stratification, diffusive transport and settling, zooplankton and algae. Algae were represented as having either constant phosphorus contents; or constant structural plus variable soluble phosphorus contents; or constant structural, variable soluble, and variable polyphosphate contents. Volterra-type kinetic formulas were used. These components represent all eutrophication models presently in use, except those incorporating multiple algae species. The models tested can reproduce only the spring bloom; they fail qualitatively to represent late summer conditions or during other seasons. GRA

N79-16450# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.

ELECTRIC UTILITY STEAM GENERATING UNITS - PARTICULATE MATTER, BACKGROUND INFORMATION FOR PROPOSED EMISSION STANDARDS

Jul. 1978 182 p
(PB-286224/1; EPA-450/2-78-006A) Avail: NTIS HC A09/MF A01 CSCL 13B

Revised Standards of Performance for the control of emissions of particulate matter from electric utility power plants are considered. These standards would apply only to electric utility steam generating units capable of combusting more than 73 megawatts heat input (250 million Btu/hr) of fossil fuel and for which construction or modification began on or after the date of proposal of the regulations. Background information, environmental and economic impact assessments, and the rationale for the standards are given. GRA

N79-16451# Mitre Corp., McLean, Va. METREK Div.
ELECTRIC UTILITY STEAM GENERATING UNITS BACKGROUND INFORMATION FOR PROPOSED SO2 EMISSION STANDARDS Final Report
Jul. 1978 488 p refs
(Contract EPA-68-02-2526)
(PB-286225/8; EPA-450/2-78-007A) Avail: NTIS HC A21/MF A01 CSCL 13B

The legal alternatives to revising the standard of performance for sulfur dioxide emissions from steam/electric generators with heat inputs greater than 250 million BTU/hour are discussed along with alternative sulfur dioxide control technologies. The environmental and economic impact of various alternative sulfur dioxide standards are included. 50 references to detailed technical reports discussing all aspects of flue gas desulfurization at steam/electric generators are given. GRA

N79-16452# Research Triangle Inst., Research Triangle Park, N. C.
ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: BROMINATED CHEMICALS, PART 1 Final Report, 19 Jul. - 16 Dec. 1977
E. D. Pellizzari, R. A. Zweidinger, and M. D. Erickson Jun. 1978 325 p refs 3 Vol.
(Contract EPA-68-01-1978)
(PB-286484/1; EPA-560/6-78-002-Pt-1) Avail: NTIS HC A14/MF A01; also available in set of 3 reports HC E13 as PB-286482-SET CSCL 07D

Sampling and analysis was designed to determine ambient concentrations of ethylene dibromide and other brominated chemicals near production facilities in El Dorado and Magnolia, AR. A characterization was made of the environmental matrices - air, water, soil, sediment and biota - for the presence and levels of ethylene dibromide, vinyl bromide and other related chemicals surrounding the bromine industry. GRA

N79-16453# Research Triangle Inst., Research Triangle Park, N. C.
ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: BROMINATED CHEMICALS. PART 2: APPENDIX Final Report, 19 Jul. - 16 Dec. 1977
E. D. Pellizzari, R. A. Zweidinger, and M. D. Erickson Jun. 1978 165 p refs 3 Vol.
(Contract EPA-68-01-1978)
(PB-286483/3; EPA-560/6-78-002A-Part-2) Avail: NTIS HC A08/MF A01; also available in set of 3 reports HC E13 as PB-286482-SET CSCL 07D

Sampling and analysis was designed to determine ambient concentrations of ethylene dibromide and other brominated chemicals near production facilities in El Dorado and Magnolia, AK. A characterization was made of the environmental matrices - air, water, soil, sediment and biota - for the presence and levels of ethylene dibromide, vinyl bromide and other related chemicals surrounding the bromine industry. GRA

N79-16454# Monsanto Research Corp., Dayton, Ohio.
ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: BETA-CHLOROETHERS Final Report, May 1976 - Jun. 1978
Paul L. Sherman, A. Melvin Kemmer, Leroy Metcalfe, and Harlan D. Toy Jun. 1978 271 p refs
(Contract EPA-68-01-1980)
(PB-286485/8; MRC-DA-779; EPA-560/6-78-003) Avail: NTIS HC A12/MF A01; also available in set of 3 reports HC E13 as PB-286482-SET CSCL 07D

Sampling, workup and analysis methods were developed for six B-chloroethers in air, water, soil and sediment samples to evaluate possible environmental contamination by this class of compounds. Four types of samples were collected near eight industrial sites which were potential emitters of B-chloroethers. Water samples were collected either as grab samples or integrated 24-hour samples with a peristaltic pump. Soil and sediment samples were transported in glass canning jars. Air sampling tubes were desorbed with methanol with a procedure developed at MRC. Water samples were solvent extracted with methylene chloride. Soil and sediment samples were extracted. GRA

N79-16455# California State Dept. of Health, Berkeley. Air and Industrial Hygiene Lab.
EFFECT OF ENVIRONMENTAL VARIABLES AND SAMPLING MEDIA ON THE COLLECTION OF ATMOSPHERIC SULFATE AND NITRATE, VOLUME 1 Final Report
B. R. Appel, Y. Tokiwa, S. M. Wall, E. M. Hoffer, and M. Haik Jan. 1978 180 p refs 2 Vol.
(PB-286480/9; CA/DOH/AIHL/SP-11-Vol-1; ARB-R-5-1032-78-86-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 14B

The errors in the determination of atmospheric sulfate and nitrate employing filter sampling were studied. Seven filter media were evaluated including Fluoropore, Whatman 41, Gelman GA-1, Gelman A, Gelman Spectrogrades, Geiman EPA Grade and MSA 1106BH. THe evaluation employed both field sampling and laboratory studies of the interaction of filter media, particulate matter and potential oxidation catalysts with pollutant gases (SO2, NO2, HNO3, NH3, O3). Field studies demonstrated that Fluoropore filter samples exhibited the lowest levels of artifact sulfate and nitrate, consistent with the behavior of clean Fluoropore filters in laboratory exposure studies. Glass and cellulose fiber high volume filter samples provided significant levels of both artifact sulfate and nitrate in field and laboratory studies. Particulate matter exhibited only a negligible role in influencing artifact sulfate. Manganese and copper oxide on filters were shown to produce sulfate from SO2 exposures. Soot, iron and vanadium oxides had no effect. GRA

N79-16456# California State Dept. of Health, Berkeley. Air and Industrial Hygiene Lab.
EFFECT OF ENVIRONMENTAL VARIABLES AND SAMPLING MEDIA ON THE COLLECTION OF ATMOSPHERIC SULFATE AND NITRATE. VOLUME 2: APPENDICES Final Report
B. R. Appel, Y. Tokiwa, S. M. Wall, E. L. Kothny, E. M. Hoffer, M. Haik, and J. J. Wesolowski Jan. 1978 79 p 2 Vol.
(PB-286481/7; CA/DOH/AIHL/SP-11-App-Vol-2; ARB-R-5-1032-78-87-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 14B

The errors in the determination of atmospheric sulfate and nitrate employing filter sampling were studied. Seven filter media were evaluated including Fluoropore, Whatman 41, Gelman GA-1, Gelman A, Gelman Spectrograde, Gelman EPA Grade and NSA 1106BH. The evaluation employed both field sampling and laboratory studies of the interaction of filter media, particulate matter and potential oxidation catalysts with pollutant gases (SO2, NO2, HNO3, NH3, O3). Field studies demonstrated that Fluoropore filter samples exhibited the lowest levels of artifact sulfate and nitrate, consistent with the behavior of clean Fluoropore filters in laboratory exposure studies. Glass and cellulose fiber high volume filter samples provided significant levels of both artifact sulfate and nitrate in field and laboratory studies. Particulate matter exhibited only a negligible role in influencing artifact sulfate. Manganese and copper oxide on filters were shown to produce sulfate from SO2 exposures. Soot, iron and vanadium oxides had no effect. GRA

N79-16457# Environmental Research and Technology, Inc., Concord, Mass.
SULFUR ISOTOPE STUDIES OF BIOGENIC SULFUR EMISSIONS AT WALLOPS ISLAND, VIRGINIA
D. R. Hitchcock (Hitchcock Associates), M. S. Black (Analytical Services), and R. P. Herbst Mar. 1978 204 p refs
(Grant NSF ENV-76-16703)
(PB-286556/6; ERT-P-2058; NSF/RA-780086) Avail: NTIS HC A10/MF A01 CSCL 04A

Sulfur dioxide and particulate sulfur samples were collected at a coastal marine location and their delta (34)S values were determined. These data were used together with sodium concentrations to determine the presence of biogenic sulfur and the identity of the biological processes producing it. Excess (nonseasalt) sulfate levels ranged from 2 to 26 micrograms/cu m and SO2 from 1 to 9 ppb. Analyses of air mass origins and lead concentrations indicated that some anthropogenic contaminants were present on all days, but the isotope data revealed that most of the atmospheric sulfur originated locally from the metabolism of bacterial sulfate reducers on all days, and that the atmospheric reactions leading to the production of sulfate from this biogenic sulfur source are extremely rapid. GRA

N79-16458# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Hydraulics.

SURFACE DISCHARGE OF COOLING WATER: EFFECTS OF DISTORTION IN MODEL INVESTIGATIONS

Steffen Haeggstroem 1978 174 p refs

(PB-287098/8; SER-A-3; ISSN-0348-1050) Avail: NTIS HC A08/MF A01 CSCL 08H

Scaling effects arise when the spread of cooling water is studied in a physical model with different horizontal and vertical length scale ratios. The investigation was limited to surface discharges under stationary conditions. Froude and Reynolds modeling practice was presumed. Different physical processes of importance were studied and the effects of distortion were evaluated. The analyses showed that two dimensional jet diffusion, buoyancy spread, and convective heat transport can, under certain conditions, be accurately reproduced in a distorted model. A three dimensional nonbuoyant jet will, however, have a center line excess temperature that is too great. GRA

N79-16459# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.

WORKSHOP ON LONG-RANGE TRAJECTORY-PUFF AND PLUME MODELING OF CONTINUOUS POINT SOURCE EMISSIONS

C. J. Nappo, Jr. (Atmospheric Turbulence and Diffusion Lab, Oak Ridge, Tenn.) Jul. 1978 18 p refs

(PB-288772/7; NOAA-TM-ERL-ARL-72; NOAA-78102408) Avail: NTIS HC A02/MF A01 CSCL 04A

Differences in thought concerning the computer modeling of long-range transport and diffusion of pollutants from continuous point sources are discussed in terms of treatment of plumes as continuous or as a series of discrete diffusing puffs. GRA

N79-16460# Oregon State Univ., Corvallis.

ENVIRONMENTAL IMPACTS OF DREDGING IN ESTUARIES Final Report

1977 682 p refs

(Grant NSF ENV-71-01908)

(PB-287927/8; NSF/RA-770667) Avail: NTIS HC A99/MF A01 CSCL 13B

The following objectives were realized: (1) identification of the important system properties of estuarine benthic deposits; (2) development of the rate-of-sediment-turnover (RST), organic content of the sediment (OCS) methodology for assessing dredging-related impacts; (3) development of monitoring methods to measure chronic long-term alterations to estuaries; and (4) identification of methodologies to incorporate results into the decision making process. It was concluded that more emphasis must be directed to the chronic impacts of dredging results from the alteration of the shape and function of an estuary. GRA

N79-16461# Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.

PHOSPHORUS SOURCE MANAGEMENT FOR EUTROPHIC LAKES. PHASE 1: TRIBUTARY PHOSPHORUS LOADING

Francesco B. Trama and Robert C. Ahlert Sep. 1978 77 p refs

(Contract DI-14-34-0001-7064)

(PB-287315/6; W78-12746; OWRT-A-047-NJ(5)) Avail: NTIS HC A05/MF A01 CSCL 13B

Contribution of phosphorus during base and storm flows was studied on several New Jersey streams. Phosphorus concentrations were very stable in the absence of point sources and major disturbances. Large changes in concentration occurred with storm flows greater than 1000 l/s, and the dissolved phosphorus fraction usually increased during peak flow unless the major rainfall was a good distance upstream from 50 to 75 percent of the true annual phosphorus load and a sizeable portion of this storm-related load was attributable to a few major storms during the year. Most of the storm-related phosphorus was associated with particulate matter. GRA

N79-16462# Westinghouse Research and Development Center, Pittsburgh, Pa.

EFFECT OF SO2 EMISSION REQUIREMENTS ON FLUIDIZED-BED COMBUSTION SYSTEMS: PRELIMINARY TECHNICAL/ECONOMIC ASSESSMENT Progress Report, Aug. 1977 - Jan. 1978

R. A. Newby, N. H. Ulerich, E. P. ONeill, D. F. Ciliberti, and D. L. Keairns Aug. 1978 192 p refs

(Contract EPA-68-02-2132)

(PB-286971/7; EPA-600/7-78-163) Avail: NTIS HC A09/MF A01 CSCL 13B

Results of a preliminary technical/economic evaluation are presented to project the impact of SO2 control requirements (up to 90% control) on the capital and energy costs of atmospheric pressure and pressurized fluidized bed combustion (AFBC) power plants. Ability of AFBC and PFBC to reduce emisssions of particulates and NOx was also considered. Performance and economic projections are presented, both for the current new source performance standards and for more stringent controls; the PFBC projections were compared with equivalent projections for conventional boilers with flue gas desulfurization. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N79-16463 Arizona Univ., Tucson.

DETERMINATION OF THE ABSORPTION OF SOLAR RADIATION BY ATMOSPHERIC AEROSOLS: APPLICATION OF THE DIFFUSE-DIRECT RADIATION METHOD Ph.D. Thesis

Todd Andrew Cerni 1978 147 p

Avail: Univ. Microfilms Order No. 7901718

Data were taken and analyzed for a total of seven days at two widely separated sites (Tucson, AZ and Laramie, WY). Certain experimental and theoretical improvements on the diffuse-direct method and its implementation are discussed. Improved radiometer designs are discussed. A new approach to the reduction of diffuse-direct data, which eliminates any dependence on Mie theory for describing the optical properties of aerosols, is put forth. Dissert. Abstr.

N79-16464 California Univ., Los Angeles.

ATMOSPHERIC SCIENCES RESEARCH IN THE ELECTRIC UTILITY INDUSTRY: THE EPRI EXPERIENCE Ph.D. Thesis

Charles Stanley Hakkarinen 1978 157 p

Avail: Univ. Microfilms Order No. 7901362

An atmospheric sciences research program at the Electric Power Research Institute (1974-1975) was developed. Planning documents were prepared for seven subprograms in the newly organized Environmental Assessment Department. Several project areas initiated at EPRI are described. Results of research projects are presented. Future research directions of EPRI in the areas of acid precipitation, climate modification, and effects of organic emissions are discussed. Dissert. Abstr.

N79-16465 Tulsa Univ., Okla.

NEW EVIDENCE ON THE FORMATION OF THE STRAIT OF GIBRALTAR Ph.D. Thesis

Mustapha Mrah 1978 172 p

Avail: Univ. Microfilms Order No. 7901565

The geology of the Strait of Gibraltar is important in

interpreting the structural, stratigraphic, and oceanographic history from the Miocene to the Recent of the Alboran Sea and the entire western Mediterranean Sea, including the Alpine system. Despite this, almost no data were available on submarine portions of the Strait. The data are presented on seismic profiles, bottom samples, detailed bathymetry, and earthquake analysis. Detailed bathymetry and 3.5 - kHz seismic profiles show that the geomorphology and the physiographic units differ largely from west to east of the Strait; smooth and gentle shelves and slopes to the west, to rocky and steep shelves and slopes to the east; with a hummocky and rough bottom floor dominated by two ridges and several closed basins. Geophysical measurements indicate that most of the bedrocks or rock debris are standing at steep angles with dip greater than 25 degree, and that the sea floor is generally blanketed by unconsolidated sediments, mainly bioclastic gravel, and terrigenous sand.

Dissert. Abstr.

N79-16466 Texas Univ. at Austin.
DEPOSITIONAL PROCESSES, DIAGENESIS AND RESERVOIR PROPERTIES OF PERMIAN DEEP-SEA SANDSTONES, BELL CANYON FORMATION, TEXAS-NEW MEXICO Ph.D. Thesis
Charles Ross Williamson 1978 276 p
Avail: Univ. Microfilms Order No. 7800653

Sand and silt of the Bell Canyon Formation were deposited in a euxinic, deep-water density-stratified basin. Laminated silt formed by suspension deposition from density interflows which moved along thermohaline interfaces; silty sand was deposited by bottom-hugging density underflows in submarine channels. The geometry of sandstone bodies is controlled by the configuration of nearly parallel, erosional channels which range from less than 0.5 km to more than 8 km in width, 1 m to greater than 35 m in depth and extend more than 70 km basinward. Channels are filled with siltstone and thick-bedded, moderately well sorted, very fine sandstone which has abundant large and small-scale tractive produced stratification, texturally nongraded sedimentation units and shows no regular vertical sequence of stratification types.

Dissert. Abstr.

N79-16467 North Carolina Univ. at Chapel Hill.
SMOG CHAMBER VALIDATION USING LAGRANGIAN ATMOSPHERIC DATA Ph.D. Thesis
Charles Eugene Feigley 1978 307 p
Avail: Univ. Microfilms Order No. 7900456

A method for validating smog chamber experimentation as a means of determining a relationship between oxidant and its precursors, hydrocarbons and nitrogen oxides, and, more specifically to attempt to validate the University of North Carolina outdoor chamber. Data from the Los Angeles Reactive Pollutant Program (LARPP) Operation 33 were analyzed to determine if these data were suitable for validation of smog chambers. A graphic technique was developed for displaying individual concentration measurements and their spatial positions on a helicopter flight pattern. Ten simulation experiments were performed. The results of the two simulations with the best execution of the experimental procedure under good meteorological conditions were compared with LARPP operation 33 observations.

Dissert. Abstr.

N79-16468 North Carolina Univ. at Chapel Hill.
DERIVATION AND EXPERIMENTAL VERIFICATION OF A BIPOLAR ION FIELD CHARGING THEORY FOR AEROSOL PARTICLES Ph.D. Thesis
Matti Juhani Jantunen 1978 85 p
Avail: Univ. Microfilms Order No. 7900468

The classical unipolar field charging theory of Rohmann and Pauthenier is expanded to include bipolar field charging and neutralizing of aerosols, and this theory is tested against an experimental two-stage alpha ionization electrostatic precipitator. Ion production as a function of normal distance from the anode is measured with an open air ion chamber, which is also developed as a part of this work. Drift angles of settling lycopodium spores in the experimental electrostatic precipitator are photographed with three settings of electrical field strength and ion concentrations, and are compared then to the drift angles computed by theory.

Dissert. Abstr.

N79-16469 Rensselaer Polytechnic Inst., Troy, N. Y.
TODGE: THE OVER DETERMINED GAUSSIAN ESTIMATOR HYPOCENTER ESTIMATION OF LOCAL MICROEARTHQUAKES Ph.D. Thesis
Michael Dean Harper 1978 90 p
Avail: Univ. Microfilms Order No. 7900226

TODGE is a computer program presently in use at Los Alamos Scientific Laboratories that estimates the hypocenter and origin time of local microearthquakes subsequent to underground nuclear testing at the Navada Test Site (NTS). The estimates are obtained by using an iterative nonlinear optimization procedure to minimize the residual sum of squares between the observed and calculated first arrival times of the seismic wave traveling from the microearthquake to the seismometers on the surface of the ground.

Dissert. Abstr.

N79-16470 Utah State Univ., Logan.
THE DESIGN, EVALUATION, OPTIMIZATION AND CALIBRATION OF A FIELD-WIDENED INTERFEROMETER SPECTROMETER USED FOR NEAR INFRARED ATMOSPHERIC MEASUREMENTS Ph.D. Thesis
Allan Joseph Steed 1978 157 p
Avail: Univ. Microfilms Order No. 7821156

Field compensation is accomplished using optical wedges, and an instrument throughput of A Omega = 1 sq cm was achieved with a resolution of 2/cm in the 1.35 to 2.7 microns region. An intrinsic Ge detector is used to make measurements in the 0.8 to 1.6 microns range. The derivations of the aberration limits for the optical insertion method of field widening are presented. An equation is developed which relates wedge drive distance to effective retardation at all wavelengths in the spectral range of the instrument. This relation makes it possible to determine wavenumber identification in the output spectra to within 0.5/cm. The design criteria of the various systems in the interferometer are investigated and required optical component tolerances are determined. An alignment process was developed to be used for initial instrument assembly as well as routine operation, and the required alignment accuracy limits are specified.

Dissert. Abstr.

N79-16471 Pennsylvania Univ., Philadelphia.
HEAT TRANSFER ANALYSIS OF NEAR SHORE ICE FORMATION, GROWTH, AND DECAY UTILIZING A NUMERICAL SIMULATION MODEL Ph.D. Thesis
John Frederick Dilley 1978 265 p
Avail: Univ. Microfilms Order No. 7824713

A near shore ice simulation model was developed to analyze the various heat fluxes leading up to and during ice episodes. This model was unique in that it was transient, two dimensional and described the heat transfer in the ice, snow, water, and soil. Detailed expressions for the environmental surface heat fluxes were used so that their individual effects on the ice formation, growth and decay could be quantitatively evaluated. The finite difference scheme used to solve the heat conduction equation was developed expressly for this application from first principles. This scheme was implicit in one (vertical) direction and explicit in the other (horizontal) direction and was designed to accommodate nonuniform grid spacing and variable thermal diffusivities, with reduced expenditure of computer time. For conditions in which the stability criterion was met, the consistency and convergence of the numerical method was proven both analytically and numerically.

Dissert. Abstr.

N79-16472*# Texas Univ., Galveston. Geophysics Lab.
FIELD MEASUREMENT OF PENETRATOR SEISMIC COUPLING IN SEDIMENTS AND VOLCANIC ROCKS
Yosio Nakamura, Gary V. Latham, and Cliff Frohlich Jan. 1979 62 p refs
(Grant NsG-2310)
(NASA-CR-158081; Contrib-316) Avail: NTIS HC A04/MF A01 CSCL 08G

Field experiments were conducted to determine experimentally how well a seismometer installed using a penetrator would be coupled to the ground. A dry lake bed and a lava bed were chosen as test sites to represent geological environments of two widely different material properties. At each site, two half-scale penetrators were fired into the ground, a three-component geophone assembly was mounted to the aft end of

each penetrator, and dummy penetrators were fired at various distances to generate seismic signals. The recorded signals were digitized, and cross-spectral analyses were performed to compare the observed signals in terms of power spectral density ratio, coherence and phase difference. The analyses indicate that seismometers deployed by penetrators will be as well coupled to the ground as are seismometers installed by conventional methods for the frequency range of interest in earthquake seismology, although some minor differences were observed at frequencies near the upper limit of the frequency band. Author

N79-16473*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY RESULTS OF SAR SOIL MOISTURE EXPERIMENT, NOVEMBER 1975
B. J. Choudhury, A. T. C. Chang, T. J. Schmugge, V. V. Salomonson, and J. R. Wang Jan. 1979 21 p refs
(NASA-TP-1404; G-7802-F21) Avail: NTIS HC A02/MF A01 CSCL 08M

The experiment was performed using the Environmental Research Institute of Michigan's (ERIM) dual-frequency and dual-polarization side-looking SAR system on board a C-46 aircraft. For each frequency, horizontally polarized pulses were transmitted and both horizontally and vertically polarized return signals were recorded on the signal film simultaneously. The test sites were located in St. Charles, Missouri; Centralia, Missouri; and Lafayette, Indiana. Each test site was a 4.83 km by 8.05 km (3 mile by 5 mile) rectangular strip of terrain. Concurrent with SAR overflight, ground soil samples of 0-to-2.5 cm and 0-to-15 cm layers were collected for soil moisture estimation. The surface features were also noted. Hard-copy image films and the digital data produced via optical processing of the signal films are analyzed in this report to study the relationship of radar backscatter to the moisture content and the surface roughness. Many difficulties associated with processing and analysis of the SAR imagery are noted. In particular, major uncertainty in the quantitative analysis appeared due to the difficulty of quality reproduction of digital data from the signal films. Author

N79-16474*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOTIONS OF CHARGED PARTICLES IN THE MAGNETOSPHERE UNDER THE INFLUENCE OF A TIME-VARYING LARGE SCALE CONVECTION ELECTRIC FIELD
Paul H. Smith, N. K. Bewtra (Computer Sciences Corp., Silver Spring, Md.), and R. A. Hoffman Jan. 1979 41 p refs Presented at the Chapman Conf.: Quantitative Modeling of Magnetospheric Processes, La Jolla, Calif., 19-22 Sep. 1978 Submitted for publication
(NASA-TM-79699) Avail: NTIS HC A03/MF A01 CSCL 04A

The motions of charged particles under the influence of the geomagnetic and electric fields were quite complex in the region of the inner magnetosphere. The Volland-Stern type large scale convection electric field was used successfully to predict both the plasmapause location and particle enhancements determined from Explorer 45 measurements. A time dependence in this electric field was introduced based on the variation in Kp for actual magnetic storm conditions. The particle trajectories were computed as they change in this time-varying electric field. Several storm fronts of particles of different magnetic moments were allowed to be injected into the inner magnetosphere from L = 10 in the equatorial plane. The motions of these fronts are presented in a movie format. J.A.M.

N79-16475*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EMERGENCE OF THE CONTINENTS
Herbert Frey Nov. 1978 17 p refs Submitted for publication (Grant NGL-21-002-033)
(NASA-TM-79669) Avail: NTIS HC A02/MF A01 CSCL 08F

If early degassing of the Earth produced a global ocean several km deep overlying a global sialic crust, then late heavy bombardment of that crust by basin forming impacting bodies would have produced topography such that by 4 billion years ago dry continential landmasses would stand above sea level. From extrapolation of lunar crater statistics, at least 50% of an original global crust on the earth would have been converted into basins averaging 4 km deep after isostatic adjustment. These basins formed the sink into which such a global ocean would drain. If the ocean was initially 2 km deep, then approximately 50% of the early Earth would have stood above sea level when the late heavy bombardment came to a close. Author

N79-16476*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSFORMATION OF SURFACE ALBEDO TO SURFACE: ATMOSPHERE SURFACE AND IRRADIANCE, AND THEIR SPECTRAL AND TEMPORAL AVERAGES
Myron L. Nack (Computer Sciences Corp.) and Robert J. Curran Aug. 1978 49 p refs Submitted for publication
(Contract NAS5-24350)
(NASA-TM-78057) Avail: NTIS HC A03/MF A01 CSCL 04A

The dependence of the albedo at the top of a realistic atmosphere upon the surface albedo, solar zenith angle, and cloud optical thickness is examined for the cases of clear sky, total cloud cover, and fractional cloud cover. The radiative transfer calculations of Dave and Braslau (1975) for particular values of surface albedo and solar zenith angle, and a single value of cloud optical thickness are used as the basis of a parametric albedo model. The question of spectral and temporal averages of albedos and reflected irradiances is addressed, and unique weighting functions for the spectral and temporal albedo averages are developed. Author

N79-16477*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASYMMETRIES IN OZONE DEPRESSIONS BETWEEN THE POLAR STRATOSPHERES FOLLOWING A SOLAR PROTON EVENT
Kaichi Maeda and Donald F. Heath Nov. 1978 10 p refs Submitted for publication
(NASA-TM-79696) Avail: NTIS HC A02/MF A01 CSCL 04A

Ozone depletions in the polar stratosphere during the energetic solar proton event on 4 August 1972 were observed by the backscattered ultraviolet (BUV) experiments on the Nimbus 4 satellite. The observed ozone contents, the ozone depressions and their temporal variations above the 4 mb level exhibited distinct asymmetries between the northern and southern hemispheres. Since the ozone destroying solar particles precipitate rather symmetrically into the two polar atmospheres, due to the geomagnetic dipole field, it is suggested that these asymmetries may be explained in terms of the differences in dynamics between the summer and the winter polar atmospheres. In the summer (northern) hemisphere, the stratospheric and mesospheric ozone depletion and recovery are smooth functions of time due to the preponderance of undistributed orderly flow in this region. On the other hand, the temporal variation of the upper stratospheric ozone in the winter polar atmosphere (southern hemisphere) exhibits large amplitude irregularities. These characteristic differences between the two polar atmospheres are also evident in the vertical distributions of temperatures and winds observed by balloons and rocket soundings. Author

N79-16478*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPUTATION OF INFRARED COOLING RATES IN THE WATER VAPOR BANDS
Ming-Dah Chou (SAI Comsystems Corp.) and Albert Arking Nov. 1978 47 p refs Submitted for publication
(NASA-TM-79693) Avail: NTIS HC A03/MF A01 CSCL 04A

A fast but accurate method for calculating the infrared radiative terms due to water vapor has been developed. It makes use of the far wing approximation to scale transmission along an inhomogeneous path to an equivalent homogeneous path. Rather than using standard conditions for scaling, the reference temperatures and pressures are chosen in this study to correspond to the regions where cooling is most significant. This greatly increased the accuracy of the new method. Compared to line by line calculations, the new method has errors up to 4% of the maximum cooling rate, while a commonly used method based upon the Goody band model (Rodgers and Walshaw, 1966) introduces errors up to 11%. The effect of temperature dependence of transmittance has also been evaluated; the cooling rate errors range up to 11% when the temperature dependence is ignored. In addition to being more accurate, the new method is much faster than those based upon the Goody band model. Author

N79-16479*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES OF SNOWPACK PROPERTIES BY PASSIVE MICROWAVE RADIOMETRY
A. T. C. Chang, D. K. Hall, J. L. Foster, A. Rango, and T. J. Schmugge Nov. 1978 17 p refs Submitted for publication
(NASA-TM-79671) Avail: NTIS HC A02/MF A01 CSCL 08L

Research involving the microwave characteristics of snow was undertaken in order to expand the information content currently available from remote sensing, namely the measurement of snowcovered area. Microwave radiation emitted from beneath the snow surface can be sensed and thus permits information on internal snowpack properties to be inferred. The intensity of radiation received is a function of the average temperature and emissivity of the snow layers and is commonly referred to as the brightness temperature (T sub b). The T sub b varies with snow grain and crystal sizes, liquid water content and snowpack temperature. The T sub b of the 0.8 cm wavelength channel was found to decrease moreso with increasing snow depth than the 1.4 cm channel. More scattering of the shorter wavelength radiation occurs thus resulting in a lower T sub b for shorter wavelengths in a dry snowpack. The longer 21.0 cm wavelength was used to assess the condition of the underlying ground. Ultimately it may be possible to estimate snow volume over large areas using calibrated brightness temperatures and consequently improve snowmelt runoff predictions. Author

N79-16480*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POSTSEISMIC SURFACE DEFORMATIONS DUE TO LITHOSPHERIC AND ASTHENOSPHERIC VISCOELASTICITY
Steven C. Cohen Nov. 1978 13 p refs Submitted for publication
(NASA-TM-79668) Avail: NTIS HC A02/MF A01 CSCL 08K

A model is proposed for post seismic surface deformations attributing them to lithospheric and asthenospheric viscoelasticity. The model predicts that the deformations due to lithospheric viscoelasticity depend on the ratio of the effective shear modulus acting long after the lithospheric viscoelastic relaxation to that acting immediately following the earthquake. While such deformations are generally smaller than those associated with asthenospheric viscoelasticity, they occur on a shorter time scale and may be in opposite direction to both the motion occurring at the time of the earthquake and that occurring as the asthenospheric relaxation occurs. G.Y.

N79-16481# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON BETWEEN THE PLASMA LINE SPECTRA IN THE F AND SPORADIC E REGIONS [COMPARACAO ENTRE O ESPECTRO DA LINHA DE PLASMA NAS REGIOES F E NA ESPORADICA E]
Ivan Jelinek Cantor Jun. 1978 16 p refs In PORTUGUESE
(INPE-1294-PE/143) Avail: NTIS HC A02/MF A01

Comparisons of the spectral types observed in the F and E regions of the ionsphere when excited by intense HF radio waves are presented. Transl. by F.O.S.

N79-16482*# California Univ., San Diego.
THE PROBLEM OF LOW ENERGY PARTICLE MEASUREMENTS IN THE MAGNETOSPHERE Final Report, 17 Dec. 1974 - 30 Sep. 1978
Elden C. Whipple, Jr. Dec. 1978 48 p refs
(Contract NAS8-31145)
(NASA-CR-150907) Avail: NTIS HC A03/MF A01 CSCL 04A

The accurate measurement of low energy (less than 100 eV) particle properties in the magnetosphere has been difficult, partly because of the low density of such particles, but more particularly because of spacecraft interference effects. Some early examples of how these phenomena have affected particle measurements on an OGO spacecraft are presented. Data obtained with the UCSD particle detectors on ATS-6 are then presented showing how some of these difficulties have been partially overcome. Future measurements of low energy particles in the magnetosphere can be improved by: (1) improving the low energy resolution of detectors; (2) building electrostatically clean spacecraft; (3) controlling spacecraft potential; and (4) using auxiliary measurements, particularly wave data. L.S.

N79-16483*# Brigham Young Univ., Provo, Utah. Dept. of Geology.
SCANNING ELECTRON MICROSCOPY AND PETROGRAPHY OF GLASSY PARTICLES PRODUCED BY LAVA FOUNTAIN ERUPTIONS Ph.D. Thesis - Final Report
Garth H. Ladle Aug. 1978 220 p refs
(Contract NAS9-14499)
(NASA-CR-160101; Contrib-3257) Avail: NTIS HC A10/MF A01 CSCL 08G

A conceptual model of a lava fountain consists of a vent, spatter ramparts, fountain column, downwind plume and associated pumice deposits. Glassy particles produced by lava fountain eruptions consist primarily of sideromelane glass and minor to moderate amounts of vesicles and crystals. Particles are classified on the basis of morphology as: (1) spherical, (2) elongate, (3) glass-coated mineral grain, (4) shard, (5) reticulite, (6) composite particle, and (7) lithic fragment. Author

N79-16484*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
METAMORPHISM, ARGON DEPLETION, HEAT FLOW AND STRESS ON THE ALPINE FAULT
Christopher H. Scholz, John Beavan, and Thomas C. Hanks (Geological Survey, Menlo Park, Calif.) [1978] 53 p refs
(Grant NGR-33-008-146)
(NASA-CR-158098) Avail: NTIS HC A04/MF A01 CSCL 08G

The Alpine fault of New Zealand is a major continental transform fault which was uplifted on its southeast side 4 to 11 km within the last 5 m.y. This uplift has exposed the Haast schists, which were metamorphosed from the adjacent Torlesse graywackes. The Haast schists increase in metamorphic grade from prehnite-pumpellyite facies 9-12 km from the fault through the chlorite and biotite zones of the greenschist facies to the garnet-oligoclase zone amphibolite facies within 4 km of the fault. These metamorphic zone boundaries are subparallel to the fault for 350 km along the strike. The K-Ar and Rb-Sr ages of the schists increase with distance from the fault: from 4 m.y. within 3 km of the fault to approximately 110 m.y. 20 km from the fault. Field relations show that the source of heat that produced the argon depletion aureole was the fault itself. Author

N79-16485# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH. INTERNATIONAL GLOBAL DATA-PROCESSING SYSTEM PLAN TO SUPPORT THE FIRST GARP GLOBAL EXPERIMENT. ANNEXES
May 1978 47 p
(WMO-469-Suppl-1; ISBN-92-63-10469-7) Avail: NTIS HC A03/MF A01; WMO, Geneva

The plan is described, together with the formats to be used for international exchange of data sets. Formats include those for upper air, aircraft, surface and marine, satellite sounding, satellite clear radiance, satellite wind - or sea surface - temperature, oceanographic, and drifting buoy. Author (ESA)

N79-16486# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE MIRANDA (X4) INFRARED EXPERIMENT. DESIGN, PERFORMANCE AND EARTH RADIANCE MEASUREMENTS
M. B. Barnes, S. Craig, and A. Haskell Nov. 1977 46 p refs
(RAE-TR-77161; BR62228) Avail: NTIS HC A03/MF A01

A description of the infrared experiment carried on the UK Miranda (X4) satellite is given. The performance of the four pyroelectric detectors used in the experiment is described and details of the technique used for measuring the radiance of the earth in the 14-16 micrometer band are presented. Finally, the measured radiance of the earth is shown for periods at monthly intervals from March to November 1974 and the implications of these results for the design of infrared earth sensors are discussed. Author

N79-16487# Royal Aircraft Establishment, Farnborough (England). Space Dept.
EVALUATION OF 14TH-ORDER HARMONICS IN THE GEOPOTENTIAL
D. G. King-Hele, Doreen M. C. Walker, and R. H. Gooding Feb. 1978 39 p refs
(RAE-TR-78015; BR62474) Avail: NTIS HC A03/MF A01

Evaluation of individual 14th-order coefficients in the geopotential from analysis of the variations in inclination and eccentricity of satellite orbits passing through 14th-order resonance under the action of air drag is described. Using results from eleven satellites, values for eighteen normalized coefficients of harmonics of order 14 and degree 14, 15 ....22 are found. These values provide a test of the accuracy of the 14th-order coefficients in comprehensive geoid models. Detailed comparisons with three recent models are made, showing good agreement on some coefficients and discrepancies on others. J.M.S.

N79-16488# Department of Agriculture, Washington, D.C. Great Lakes Environmental Research Lab.
PHOTOSYNTHETICALLY ACTIVE RADIATION TRANSMISSION THROUGH ICE
Jul. 1978 57 p
(PB-288463/3; NOAA-TM-ERL-GLERL-18; GLERL-CONTRIB-119; NOAA-78101903) Avail: NTIS HC A04/MF A01 CSCL 08L

The amount of radiation penetrating an ice or a combined ice and snow cover is often critical to the survival of plants and animals in both large and small freshwater lakes. Radiation transmittance through clear, refrozen slush, and brash ice, from the ice surface to the ice-water interface, in the 400-700 nm range varied according to ice type, atmospheric conditions, snow cover, and solar altitude. Snow cover caused the most significant diminution of radiation. During periods of snowmelt, radiation transmittance through snow-covered ice surfaces increased slightly. GRA

N79-16489# National Environmental Satellite Service, Washington, D. C.
AN EMPIRICAL MODEL FOR ATMOSPHERIC TRANSMITTANCE FUNCTIONS AND ITS APPLICATION TO THE NIMBUS-6 HIRS EXPERIMENT
P. G. Abel, A. Arking (NASA, Goddard), and W. L. Smith Sep. 1978 35 p refs
(PB-288487/2; NOAA-TM-NESS-99) Avail: NTIS HC A03/MF A01 CSCL 04A

A model is formulated for determining the transmission in an atmosphere with an arbitrary temperature and water vapor profile. The transmission model uses eigenvectors of covariance matrices generated from a statistical sample of atmospheric conditions, for which temperature and water vapor profiles are specified and transmittances are calculated using a line-by-line method. A matrix which relates the coefficients of the transmittance eigenvectors to those of the temperature/water vapor eigenvectors is determined by least squares regression. Application of the model indicates that the transmittance model reproduces the line-by-line computations to an accuracy of better than 1.5 percent. GRA

N79-16490# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
FLOW STRUCTURE AND TURBULENT DIFFUSION AROUND A THREE-DIMENSIONAL HILL. FLUID MODELING STUDY ON EFFECTS OF STRATIFICATION. PART 1: FLOW STRUCTURE Final Report
Julian C. R. Hunt, William H. Snyder (Environ. Sci. Res. Lab., Research Triangle Park, N. C.), and Robert H. Lawson, Jr. (Northrop Serv., Inc., Research Triangle Park, N. C.) Jul. 1978 98 p refs Sponsored by EPA
(PB-287101/0; EPA-600/4-78-041; Rept-4) Avail: NTIS HC A05/MF A01 CSCL 04A

A program was initiated with the overall objective of gaining understanding of the flow and diffusion of pollutants in complex terrain under both neutral and stably stratified conditions. This report covers the first phase of the project; it describes the flow structure observed over a bell shaped hill (polynomial in cross section) through neutral wind tunnel studies and stably stratified towing tank studies. It verifies and establishes the limits of applicability of Drazin's theory for flow over three-dimensional hills under conditions of small Froude number. Flow visualization techniques are used extensively in obtaining both qualitative and quantitative information on the flow structure around the hill. GRA

N79-16007*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROWAVE RADIOMETER MEASUREMENT OF WATER VAPOR PATH DELAY: DATA REDUCTION TECHNIQUES
E. S. Claflin, S. C. Wu, and G. M. Resch *In its* The Deep Space Network 15 Dec. 1978 p 22-30 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-16491 Texas A&M Univ., College Station.
MESOSCALE THERMAL STRUCTURE OF THE POLAR FRONT ZONE IN DRAKE PASSAGE DURING THE AUSTRAL SUMMER OF 1976 Ph.D. Thesis
Steven Leroy Patterson 1978 155 p
Avail: Univ. Microfilms Order No. 7900998

The boundary between the Subantarctic and Antarctic surface waters within the Southern Ocean is known as the Polar Front. This front lies within a complex transition region referred to as the Polar Front Zone (PFZ). Vertical sections of temperature across the PFZ presented in the literature reveal a variety of complex thermal structures which have led to different interpretations of both the basic structure and the dynamics of the PFZ. A review of these evolving ideas about the Polar Front, the PFZ and the Antarctic Circumpolar Current is presented. Dissert. Abstr.

N79-16492 Laboratoire de Meteorologie Dynamique/LMD/du CNRS, Palaiseau (France).
FRENCH PARTICIPATION IN THE GARP TROPICAL EXPERIMENT. MONEX PROGRAM, 1975 Final Report [PARTICIPATION FRANCAISE A L'EXPERIENCE TROPICALE DU GARP. PROGRAMME MONEX 1975]
Pierre Morel Oct. 1977 27 p refs In FRENCH
(Contract DGRST-75-7-0337)
Avail: NTIS HC A03

Forty-five low altitude balloons launched from the Seychelles Islands in the Indian Ocean transmitted atmospheric pressure measurements to the Nimbus F satellite. The durability, vertical stability, flight characteristics, and trajectories of the balloons are discussed. The meteorological fields above the Indian Ocean are analyzed as well as the influence of tropical perturbation on monsoons. Transl. by A.R.H.

N79-16493*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SIMPLIFIED METHOD FOR CALCULATING THE ATMOSPHERIC HEATING RATE BY ABSORPTION OF SOLAR RADIATION IN THE STRATOSPHERE AND MESOSPHERE
Tatsuo Shimazaki and Leland C. Helmle (Informatics, Inc., Palo Alto, Calif.) Jan. 1979 34 p refs
(NASA-TP-1398; A-7557) Avail: NTIS HC A04/MF A01 CSCL 04B

Calculations of the atmospheric heating rate by absorption of solar radiation by O3, H2O, and CO2 are reported. The method needs only seven parameters for each molecule and is particularly useful for heating calculations in three-dimensional global circulation models below 80 km. Applying the formula to the observed distributions of O3, H2O, and CO2 produces reasonable latitudinal and seasonal variations in the heating rate. The calculated heating rate, however, is sensitive to the global distributions of the absorbing gases, and uncertainties in the O3 distribution above approximately 50 km and the H2O distribution below approximately 20 km may seriously affect the global distributions of the heating rate in these regions. G.G.

N79-16494*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ALBEDO CLIMATOLOGY ANALYSIS AND THE DETERMINATION OF FRACTIONAL CLOUD COVER
Robert J. Curran, Raymond Wexler, and Myron L. Nack (Computer Sciences Corp., Silver Spring, Md.) Jun. 1978 52 p refs Submitted for publication
(NASA-TM-79576) Avail: NTIS HC A04/MF A01 CSCL 04B

Monthly and zonally averaged surface cover climatology data are presented which are used to construct monthly and zonally averaged surface albedos. The albedo transformations are then applied to the surface albedos, using solar zenith angles characteristic of the Nimbus 6 satellite local sampling times, to obtain albedos at the top of clear and totally cloud covered atmospheres. These albedos are then combined with measured albedo data to solve for the monthly and zonally averaged fractional cloud cover. The measured albedo data were obtained from the wide field of view channels of the Nimbus 6 Earth Radiation Budget experiment, and consequently the fractional cloud cover results are representative of the local sampling times. These fractional cloud cover results are compared with recent studies. The cloud cover results not only show peaks near the intertropical convergence zone, but the monthly migration of the position of these peaks follows general predictions of atmospheric circulation studies. Author

N79-16495# Compagnia Nazionale Aerospaziale C.N.A. S.p.A., Rome (Italy).
COMPLEMENTARY PREDEFINITION STUDY OF A METEOROLOGICAL DATA DISTRIBUTION AND LASSO MISSION USING A SIRIO BUS. PHASE A EXTENSION AND PRELIMINARY PHASE B Final Report
Paris ESA 20 Jul. 1978 113 p
(Contract ESA-3472/78-F-CG-SC)
(X-TR-004; ESA-CR(P)-1109) Avail: NTIS HC A06/MF A01

The main results of the meteorological data distribution and LASSO mission study are summarized and the detailed technical documents produced are referenced; the main results of the preceeding Phase A are also summarized. It is demonstrated that the advancement of the work for the Sirio 2 program is sufficient to permit an efficient start of the realization program. Author (ESA)

N79-16496# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
TROPICAL CLOUD BANDS AND LARGE-SCALE DEFORMATION Final Report
Frederick Sanders 6 Oct. 1977 22 p refs
(Grant NOAA-04-5-022-9)
(PB-288560/6; NOAA-78100404) Avail: NTIS HC A02/MF A01 CSCL 04B

An abstract of a study on the dynamics of extratropical oceanic cyclones is presented. This is followed by a reprint of a paper entitled, The Effect of Incorrect Initial Analysis on the Predicted Deepening of Oceanic Cyclones. A reprint of another paper entitled, Synoptic Scale Deformation and Tropical Cloud Bonds, is also included. G.Y.

N79-16497# AIA Research Corp., Washington, D. C.
PHASE ONE/BASE DATA FOR THE DEVELOPMENT OF ENERGY PERFORMANCE STANDARDS FOR NEW BUILDINGS. CLIMATIC CLASSIFICATION
30 Jan. 1978 39 p
(Contract HUD-H-2689)
(PB-286900/6; HUD-0000190) Avail: NTIS HC A04/MF A01 CSCL 04B

Alternatives for the development of an adequate climatic classification system for use in establishing energy performance standards for new buildings were examined. Criteria were devised to ensure reasonable applicability of the selected climatic classification system, and a preliminary examination of climatic variables and their relationship to energy consumption was conducted. The development of a graphic matrix to illustrate relationships between estimated energy performance and both building type and climatic region is described and illustrated. GRA

N79-16498# Illinois State Water Survey, Urbana.
CHICAGO HYDROMETEOROLOGICAL AREA PROJECT: A COMPREHENSIVE NEW STUDY OF URBAN HYDROMETEOROLOGY Final Report, Feb. 1976 - Jul. 1978
Floyd A. Huff, Stanley A. Changnon, Jr., N. G. Towery, and J. L. Vogel Jul. 1978 58 p refs
(Grant NSF ENV-76-01447)
(PB-287011/1; NSF/RA-780247) Avail: NTIS HC A04/MF A01 CSCL 04B

All the historical rainfall data available for the area was procured and studied. The resulting analyses were aimed primarily at providing rainfall information of various types that would be useful to urban hydrologists in the design of storm-sanitary sewer systems. Further research was aimed at the extensive needs for a more sophisticated comprehensive urban hydrometeorological investigation. The extensive rainfall measurement program. Phase 2, has included the development of the world's largest dense raingage network of over 320 recording raingages and a new advanced 10-cm weather radar with state-of-the-art signal processing and an attached computer that allows for rapid digitization of rainfall data. GRA

N79-16499# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A BASIC COMPARISON OF LIDAR AND RADAR FOR REMOTE SENSING OF CLOUDS
V. E. Derr Mar. 1978 20 p refs
(PB-288473/2; NOAA-TR-ERL-397; WPL-52;
NOAA-78100602) Avail: NTIS HC A02/MF A01 CSCL 04B

Both radar and lidar have proved valuable in studying cloud microphysics and dynamics. Because of the large difference in wave length, the two techniques have differing penetration capabilities and detection sensitivities. A system-free comparison of radar and lidar for several missions and many cloud types is presented to permit the optimum choice of technique for field studies of cloud formation, development, and precipitation. GRA

N79-16500# Chicago Univ., Ill. Dept. of Geophysical Sciences.
THREE SCALES OF MOTIONS ASSOCIATED WITH TORNADOES
Gregory S. Forbes Sep. 1978 394 p refs
(Contract NRC-04-74-239)
(PB-288291/8; NUREG-CR-0363) Avail: NTIS HC A17/MF A01 CSCL 04B

The character of the tornado cyclone, the tornado, and the suction vortex are explained. The tornado cyclone represents a scale of motion which is larger than the tornado, associated with a parent thunderstorm. Thunderstorms, which produce tornadoes often possess rotation in the form of a mesocyclone (diameter of several kilometers) whose cyclonic wind field often causes the radar echo of the thunderstorm to take the shape of a hook. Only a portion of the mesocyclone is concentrated into the tornado cyclone. The tornado cyclone is studied through use of radar and aerial photographs of damage caused by tornado cyclone winds. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-16501 Rensselaer Polytechnic Inst., Troy, N. Y.
SEDIMENTARY ENVIRONMENTS OF THE NORTHERN GULFS OF THE RED SEA Ph.D. Thesis
Amihai Sneh 1978 150 p
Avail: Univ. Microfilms Order No. 7900242

The sea-marginal environments of the northern gulfs of the Red Sea are type examples for sedimentation in an arid region on shelves of migrating plates. The complex of environments, from land seaward, includes: fans, sabkhas, tidal flats (mainly in the Gulf of Suez), and reefs. Dissert. Abstr.

N79-16502 Texas A&M Univ., College Station.
AN INVESTIGATION OF DISPERSIVE AND NONDISPERSIVE LONG WAVE EQUATIONS APPLIED TO OCEANS OF

VARIABLE DEPTH Ph.D. Thesis
William John Mass 1978 96 p
Avail: Univ. Microfilms Order No. 7900990

The principle modification mechanisms for tsunamis propagating in one horizontal dimension are phase dispersion and reflection from bottom topography. These mechanisms are studied separately by developing models which either include or exclude phase dispersion. Variational principles along with a set of scaling parameters are employed to derive approximate quasi-long wave equations in one horizontal dimension. A finite difference numerical model is developed for nondispersive wave propagating over regions of variable depth. A second finite difference algorithm is developed which provides for phase dispersion as well as variable topography. A method of solution used by workers in the band theory of metals is presented and special periodic topographies that yield exact solutions are discussed. Dissert. Abstr.

N79-16503 California Univ., San Diego.
OBSERVATIONS OF HORIZONTAL VELOCITY IN THE UPPER OCEAN MADE WITH A NEW VECTOR MEASURING CURRENT METER Ph.D. Thesis
Robert Andrew Weller 1978 187 p
Avail: Univ. Microfilms Order No. 7901054

A current meter was developed and tested. The goal in developing a new current meter was to build an instrument suitable for use in the upper ocean, capable of accurately measuring small mean flows in the presence of large oscillatory flows associated with surface waves and/or mooring motion. Propeller sensors were developed with accurate cosine response; and two such sensors were mounted at right angles on an instrument which, because of its ability to directly measure the components of horizontal velocity, was called a Vector Measuring Current Meter (VMCM). Two tests in combinations of steady and unsteady flows documented the performance of the instrument. The VMCMs were first used as velocity profilers at the equator at 150 degrees W in August, 1976. The VMCMs were deployed from the Research Platform FLIP as it drifted off the coast of California in January, 1977. Dissert. Abstr.

N79-16504 Rhode Island Univ., Kingston.
PALEOCEANOGRAPHY OF THE SANTA BARBARA BASIN AND THE CALIFORNIA CURRENT DURING THE LAST 8000 YEARS Ph.D. Thesis
Nicklas George Pisias 1978 236 p
Avail: Univ. Microfilms Order No. 7820589

The varved sediments of the Santa Barbara Basin off southern California offer a unique opportunity to study the changes in oceanographic conditions of this nearshore area during the last 8000 years. Quantitative analysis of Radiolaria found in recent surface sediment samples from the eastern North Pacific allows the identification of four assemblages which can be related to the physical oceanography of the California Current. Past sea-surface temperatures for the month of February were calculated. The 8000 year time series of these parameters show significant fluctuations over the time period studied. Prior to 5400 yr B.P. the Santa Barbara Basin was characterized by a subtropical radiolarian fauna and by sea-surface temperatures that were warmer than present. The intervals from 800 to 1800 yr B.P., and 3600 to 3800 yr B.P. also were generally warmer than today. Dissert. Abstr.

N79-16505 California Univ., Los Angeles.
MARINE TERRACES BETWEEN PLAYA EL MARRON AND MORRO SANTO DOMINGO, CENTRAL BAJA CALIFORNIA, MEXICO Ph.D. Thesis
Alan James Woods 1978 205 p
Avail: Univ. Microfilms Order No. 7901417

The marine terraces between Playa El Marron and Morro Santo Domingo are the most extensive Pleistocene planation surfaces in central Baja California. Several Pleistocene shorelines are quite visible and can be traced alongshore from Playa El Marron to Arroyo El Salinito. In order of decreasing elevation, they are the Aeropuerto, Andres, and Tomatal marine terraces (informal nomenclature). Marine terrace expression varies but is, generally, bet on the widespread Teritary marine sediments. The deposits on the lowest marine terrace, the Tomatal, are 120,000 to 140,000 years old and are probably associated with the higher sea level of the Sangamonian Interglacial Stage. The absolute ages of the two higher terraces, the Andres and Aeropuerto, are unknown but they are older than the Tomatal terrace and increase with increasing elevation. The Tomatal marine terrace is particularly well developed, comprising both erosional features, such as degraded sea cliffs and a wave cut platform up to one kilometer wide, and depositional elements including dunes, lagoonal sequences, and shingle paleo-beam ridges. Dissert. Abstr.

N79-16506*# Technology Service Corp., Silver Spring, Md.
OPTIMIZATION OF SATELLITE ALTIMETER AND WAVE HEIGHT MEASUREMENTS Final Report, Oct. 1975 - Mar. 1976
R. P. Dooley and L. W. Brooks Jan. 1979 45 p refs
(Contract NAS6-2601)
(NASA-CR-156850) Avail: NTIS HC A03/MF A01 CSCL 08J

Two techniques for simultaneously estimating altitude, ocean wave height, and signal-to-noise ratio from the GEOS-C satellite altimeter data are described. One technique was based on maximum likelihood estimation, MLE, and the other on minimum mean square error estimation, MMSE. Performance was determined by comparing the variance and bias of each technique with the variance and bias of the smoothed output from the Geos altimeter tracker. Ocean wave height tracking performance for the MLE and MMSE algorithms was measured by comparing the variance and bias of the wave height estimates with that of the expression for the return waveform obtained by a fit to the average output of the 16 waveform sampling gates. J.A.M.

N79-16507# Research Inst. of National Defence, Stockholm (Sweden).
MARINE TECHNOLOGY. A MAJOR CIVILIAN RESEARCH PROGRAM FOR SWEDISH BOARD FOR TECHNICAL DEVELOPMENT (STU) AND SWEDISH NATIONAL DEFENCE RESEARCH INSTITUTE (FOA)
1978 8 p
Avail: NTIS HC A02/MF A01

The program is composed of two main parts one of which concerns methods and technical systems for seeing and working underwater, with both divers and unmanned vehicles. The other part relating to low geological and seismological measurements can be used to detect natural resources below the sea belt. Both parts are described in general terms. ESA

N79-16508# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS: SOLAR RADIATION IN PERU DURING JOINT-2: A GUIDE FOR MODELERS Technical Report 43
Michael J. Mickelson May 1978 46 p refs Sponsored by NSF
(PB-287354/5; Contrib-78006; NSF/IDOE-78/103; NSF/IDOE/CUEA/TR-43) Avail: NTIS HC A03/MF A01 CSCL 08A

Solar radiation was measured above and below the sea surface during the Joint-II expedition to the coastal upwelling region of Peru. This report compares the daily totals of global solar radiation above the sea surface with values predicted by four models. Solar data taken in Maine is analyzed in the same manner. The effects of coastal fog on daily solar radiation are considered at both locations. The dependence of solar radiation on time of day is compared to three trigonometric models. The output of a sensor is compared to that of a pyranometer to obtain a conversion factor for daily pyranometer records. Underwater light measurements are used to determine surface losses of light entering the euphotic zone. GRA

N79-16509# National Environmental Satellite Service, Washington, D. C.
QUANTITATIVE MEASUREMENTS OF SEA SURFACE TEMPERATURE AT SEVERAL LOCATIONS USING THE NOAA-3 VERY HIGH RESOLUTION RADIOMETER
Laurence Breaker, Jack Klein (GE Co., Fairfield, Conn.), and Michael Pitts (LMSC, Inc., Sunnyvale, Calif.) Sep. 1978 34 p refs
(PB-288488/0; NOAA-TM-NESS-98; NOAA-78101902) Avail: NTIS HC A03/MF A01 CSCL 08J

Satellite inferred sea surface temperature was compared with

ground truth measurements at three locations. These comparisons were based on infrared data from the very high resolution radiometer aboard the NOAA-3 polar-orbiting satellite. Absolute values of sea surface temperatures were inferred using standard in-flight calibration procedures and simple models to estimate atmospheric attenuation. One of the two models used may provide better estimates of atmospheric attenuation under certain conditions. Excellent agreement was found in two out of three comparisons. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-16510 Rutgers - The State Univ., New Brunswick, N. J.
A STUDY OF CEREBRAL BLOOD FLOW IN THE GOAT. A. CORRELATIONS BETWEEN THE VENTILATORY AND CEREBROVASCULAR RESPONSES TO CARBON MONOXIDE INHALATION. B. THE DYNAMICS OF THE CEREBRAL BLOOD FLOW RESPONSE TO HYPOXIA BY FREQUENCY RESPONSE ANALYSIS Ph.D. Thesis
Dennis Delmar Doblar 1978 145 p
Avail: Univ. Microfilms Order No. 7901251

The cerebrovascular control system was studied as it responded to changes in oxygenation of arterial blood. Two separate studies were undertaken to determine the relationship between cerebral blood flow (CBF) and the ventilatory responses to carbon monoxide inhalation, and to study the dynamic characteristics of the CBF response to hypoxic hypoxia with fixed ventilatory parameters. Simultaneous measurements were made of carboxyhemoglobin levels in arterial blood, ventilation, CBF, O2 delivery to the brain, and O2 tension in cerebral venous blood during inhalation of 1% CO in 40% O2 by six unanesthetized goats. Dissert. Abstr.

N79-16511 Kansas Univ., Lawrence.
THE EFFECT OF HYPEROXIA ON CEREBRAL BLOOD FLOW IN THE UNANESTHETIZED PONY Ph.D. Thesis
David William Busija 1978 75 p
Avail: Univ. Microfilms Order No. 7824779

Previous studies on unanesthetized ponies provide indirect evidence that cerebral blood flow (CBF) decreases during moderate hyperoxia (40% O2 in N2). Experiments were designed to directly measure CBF during 2 levels of normocanic hyperoxia. Cerebral blood flow, the acid-base status of cerebrospinal fluid (CSF) and arterial blood, ventilation and hemodynamics were measured in 13 unanesthetized ponies during the following conditions: (1) control, breathing room air (PB = 738 mm Hg); (2) after 60 minutes of breathing 40% O2 in N2; and (3) following an additional 60 minutes of breathing 100% O2 with sufficient CO2 (2.2 to 4.5%) added to the inspired gas to maintain the partial pressure of CO2 in the arterial blood (PaCO2) at the control level. Cerebral blood flow and cardiac output were measured using radioactive microspheres, 15 microns in diameter, labeled with 46Sc, 125I, 65SR and 153Gd. Cerebrospinal fluid pH and PCO2, and pHa, PaCO2 and PaO2 were measured using conventional radiometer electrodes. Dissert. Abstr.

N79-16512*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
METEOROLOGICAL LIMITS ON THE GROWTH AND DEVELOPMENT OF SCREWWORM POPULATIONS
D. E. Phinney and G. K. Arp Oct. 1978 26 p refs
(Contract NAS9-12200)
(NASA-CR-151873; LEC-12395; JSC-14576) Avail: NTIS HC A03/MF A01 CSCL 06C

A program to evaluate the use of remotely sensed data as an additional tool in existing and projected efforts to eradicate the screwworm began in 1973. Estimating weather conditions by use of remotely sensed data was part of the study. Next, the effect of weather on screwworm populations was modeled. A significant portion of the variation in screwworm population growth and development has been traced to weather-related parameters. This report deals with the salient points of the weather and the screwworm population interaction. Author

N79-16513# Los Angeles State and County Arboretum, Arcadia, Calif.
MECHANISM OF PLANT VIRUS INACTIVATION IN SOIL INJECTED WITH MUNICIPAL WASTEWATER AND TREATMENT PLANT SLUDGES Interim Report, Dec. 1977 - Jun. 1978
P. C. Cheo 1978 36 p
(Grant NSF ENV-76-82743)
(PB-287012/9; NSF/RA-780251) Avail: NTIS HC A03/MF A01 CSCL 06M

The fact that microbiological factors can degrade TMV in a soil environment was established by laboratory experiments. Biological assay of isolates from soil using the autoclaved soil vial system has indicated that the majority of bacteria isolates do not show any activity. Several isolates, however, show a positive response in such a complex and noncriterion system. An alternate medium for the bacteria-TMV interaction assay system is presently being developed. Glass beads in the size range of 0.2 mm and 0.11 mm in diameter, and silica sand, 30 and 60 mesh, are being tested as possible replacement for the autoclaved soil-vial system. Preliminary data indicate that the biological factor in soil responsible for TMV degradation can be determined using the glass beads system. GRA

N79-16514# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 13, NO. 1, 1979
14 Feb. 1979 113 p refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., (Moscow), no. 1, 1979 p 3-75
(JPRS-72826) Avail: NTIS HC A06/MF A01

Human and animal physiological responses to space flight stress were studied. For individual titles, see N79-16515 through N79-16534.

N79-16515# Joint Publications Research Service, Arlington, Va.
EFFECT OF 49-DAY SPACE FLIGHT ON PARAMETERS OF IMMUNOLOGICAL REACTIVITY AND PROTEIN COMPOSITION OF BLOOD IN THE CREW OF SALYUT-5 c52
Ye. V. Guseva and R. Yu. Tashpulatov *In its* Space Biol. and Aerospace Med. Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 1-7 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., no. 1, (Moscow) 1979 p 1-7 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

The prolonged 49-day space flight resulted in a significant inhibition of immunological reactivity of the Salyut-5 crewmembers which involved a decline in bactericidal activity of the serum and lysozyme activity of the saliva, and a decrease in the content of immunoglobulins in the saliva and tonsillary lacunae. After the flight recovery of reduced immunoreactivity took a longer time than after shorter-term flights. The prolonged space mission led to an increase of most globulin fractions and a decrease of albumin in blood. With respect to globulin fractions, a predominant increase in the content of C sub 3c and C sub 4 factors of the complement and immunoglobulins G, A, M was noted. Blood proteins returned to the normal within a long period of time. Author

N79-16516# Joint Publications Research Service, Arlington, Va.
EFFECTS OF SPACE FLIGHT ON COURSE OF RADIATION LESIONS IN RAT LYMPHOID ORGANS
G. N. Durnova, A. S. Kaplanskiy, and V. V. Portugalov *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 8-11 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., No. 1, (Moscow) 1979 p 9-11 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

The spleen, thymus and inguinal lymph nodes of rats exposed to a prolonged (24 hours) irradiation at a dose of 800 rad on the 10th dat of the 20-day space flight aboard the biosatellite Cosmos-690 were examined histologically and cytologically. The lymph organs showed the changes typical of radiation-induced lesions. They did not display an aggravating or modifying effect of space flight factors on the development of radiation-induced lesions in lymph organs. It is emphasized that radiation-induced

lesions at the above irradiation dose may mask weightlessness-induced effects in lymph organs. Author

N79-16517# Joint Publications Research Service, Arlington, Va.

MORPHOLOGICAL STUDY OF ADRENALS OF RATS IRRADIATED DURING FLIGHT ABOARD KOSMOS-690 SATELLITE

Ye. A. Savina and Ye. I. Alekseyev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 12-17 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., no. 1, (Moscow) 1979 p 12-15 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Adrenals of 12 rats flown aboard the biosatellite Cosmos-690, and 30 rats used in the ground-based experiments Control-1 and Control-2, were studied morphologically. The animals were sacrificed on the 2nd and 27th days after completion of the experiments (i.e., on the 12 and 37th days after irradiation at a total dose of 800 rad). A comparative study of morphological changes in the adrenals of flight and control rats did not show any distinct differences. It is therefore concluded that space flight factors did not produce a significant effect on the adrenal response to irradiation at a dose of 800 rad. Author

N79-16518# Joint Publications Research Service, Arlington, Va.

CHANGES IN METABOLISM OF SOLEUS MUSCLE TISSUE IN RATS FOLLOWING THE FLIGHT ABOARD THE KOSMOS-690 BIOSATELLITE

M. S. Gayevskaya, N. A. Veresotskaya, N. S. Kolganova, Ye. V. Kolchina, L. M. Kurkina, and Ye. A. Nosova *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 18-22 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., no. 1, (Moscow), 1979 p 16-19 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

The soleus muscle of flown rats did not show any effect of gamma-irradiation on the composition and enzymic activity of protein fractions. On the first postflight day a significant decrease in the content of myofibrillar and sarcoplasmatic proteins in the soleus muscle was found. Besides, a drastic increase in the activity of aspartate amino-transferase and lactate dehydrogenase of sarcoplasmatic proteins and an atrophic type change in the LDH pattern were demonstrated. Those changes were similar to the weightlessness-induced processes of atrophy and dystrophy and proved reversible. Author

N79-16519# Joint Publications Research Service, Arlington, Va.

CHANGES IN AMOUNT AND COMPOSITION OF PHOSPHOLIPIDS IN RAT SKELETAL MUSCLE MICROSOMAL FRACTION UNDER THE INFLUENCE OF A FLIGHT ABOARD THE KOSMOS-690 BIOSATELLITE

R. A. Belitskaya *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 23-28 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 19-23 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

The content and composition of phospholipids in the microsomes isolated from the back femoral muscles of rats flown for 20.5 days aboard the biosatellite Cosmos-690 were studied. Gamma-irradiation applied in the ground-based control experiments did not change the amount of total phospholipids in microsomes of skeletal muscles and altered insignificantly the content of their individual fractions. On the second postflight day a substantial decrease in the content of total and fractional phospholipids in microsomes was found. The decrease seems to be induced by weightlessness. On the 26th postflight day the content of total phospholipids returned to the normal whereas their fractional composition still remained changed. Author

N79-16520# Joint Publications Research Service, Arlington, Va.

ANTIORTHOSTATIC HYPOKINESIA AS AN APPROXIMATE MODEL OF WEIGHTLESSNESS **c52**

V. M. Mikhaylov, V. P. Alekseya, M. P. Kuzmin, and E. I. Matsnev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 29-35 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 23-28 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Eight test subjects were exposed to a five day bed rest experiment in the recumbent and head-down position (at angles of 0 deg, -4 deg, -8 deg, and -12 deg) to study the physiological effects of the exposure. The head-down tilting at -4 deg and -12 deg was shown to simulate physiological effects of real space flight better than the bed rest at 0 deg. The results made it possible to model an acute stage of weightlessness adaptation and to assay the contribution of gravity-induced blood redistribution to the physiological reactions. Author

N79-16521# Joint Publications Research Service, Arlington, Va.

BIOELECTRICAL ACTIVITY OF THE BRAIN DURING 49-DAY ANTIORTHOSTATIC HYPOKINESIA IN INDIVIDUALS WITH EARLY SIGNS OF VEGETOVASCULAR DYSFUNCTION **c52**

D. A. Alekseyev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 36-43 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 28-34 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Cerebral bioelectric activity of 18 male test subjects, aged 25 to 42, was studied during their 49-day head-down tilting (-4 deg) and during recovery. On the 5th experimental day their EEG showed signs of CNS irritation and increased excitation in response to photostimulation. That was very marked in test subjects with autonomic-vascular dysfunctions. On the 15, 30, and particularly 45th experimental day, their EEG showed both diffusion and paroxysmal slow activity; CNS excitability decreased significantly during rhythmic photostimulation. By the 20th - 22nd day of recovery EEG parameters returned to normal. This indicates that the changes were reversible and that the therapeutic measures applied were effective. G.G.

N79-16522# Joint Publications Research Service, Arlington, Va.

CHANGES IN PROPERTIES OF RAT FEMUR AS A RESULT OF CRURAL EXARTICULATION AND HYPOKINESIA

G. P. Stupakov, A. I. Volozhin, V. A. Korzhenyants, V. V. Korolev, V. S. Yagodovskiy, and V. I. Yakusheva *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 44-51 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 35-40 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Rat experiments demonstrated that unilateral calf exarticulation leading to the loss of the leg weight-bearing functions resulted in a decrease of the density, ash content and mineral content in the femoral diaphysis. This manipulation reduced the mechanical strength and did not change the elastic properties of the bone. Histological examination showed osteoporosis in the cortical plate. Partial maintenance of the weight-bearing function in the animals with bilateral exarticulation of the calf prevented these changes. The results suggest that special steps taken to provide static load on leg may be effective countermeasures against atrophic changes in bones devoid of their weight-bearing function. Author

N79-16523# Joint Publications Research Service, Arlington, Va.

BLOOD CLOTTING FACTORS OF THE VASCULAR WALL AND MYOCARDIUM OF HYPOKINETIC RABBITS

V. I. Inchina and N. F. Brattsev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 52-58 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 41-46 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

The effect of hypokinesia on the hemocoagulatory and fibrinolytic properties of aorta, myocardium and venae cavae was studied. Hypokinesia decreased thromboplastic activity of the intima and increased that of the mid- and outer layers of the

aorta. Anticoagulatory properties of aortal and myocardial tissues increased whereas their antithrombin properties decreased. Rabbit immobilization increased the content of fibrinolytic stimulants in the aorta and myocardium. Author

N79-16524# Joint Publications Research Service, Arlington, Va.

EFFECT OF HYPOKINESIA ON ANIMAL RESISTANCE TO CHEMICAL AGENTS

G. P. Tikhonova, G. I. Solomin, Yu. P. Bizin, and Z. I. Pilipyuk *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 59-64 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 46-50 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

Resistance of rats exposed to 20-day hypokinesia in high concentrations of vapors of ethylacetate, dioxan, and liquid fluorochlorocarbon was studied. As compared with controls, lethality of the hypokinetic animals increased upon ethylacetate and dioxan breathing and decreased upon intoxication with liquid fluorochlorocarbon. The hypokinetic animals showed decreased resistance to chronic effects of ethylacetate and perfluorated ester vapors (at a concentration of 10 and 100 mg/cu m for 90 and 30 days, respectively). This was suggested by functional and pathomorphological studies. Author

N79-16525# Joint Publications Research Service, Arlington, Va.

CEREBRAL HEMODYNAMICS AND VISUAL ANALYZER FUNCTION FOLLOWING EXPOSURE TO BRIGHT LIGHT

V. I. Shostak and T. I. Bachurina *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 65-69 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 50-53 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

Non-anesthetized rabbits were exposed to short-term intensive photostimulation. The experiments showed that the resultant increase in cerebral circulation occurred independently from systemic circulation, cardiac and respiratory function. Simultaneously, substantial adaptive changes in the optic system measured by electroretinography and optokinetic nystagmus developed. Author

N79-16526# Joint Publications Research Service, Arlington, Va.

EFFECTS OF PROLONGED UNIDIRECTIONAL SHIFT OF SLEEPING-WAKING CYCLE ON PHYSIOLOGICAL FUNCTIONS, MENTAL PRODUCTIVITY AND SLEEP OF MAN **c52**

A. N. Litsov *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 70-76 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 53-58 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

The results of three 30-day experiments are reported that studied the effect of migration of the sleep-alertness cycle on physiological functions, psychic productivity, and sleep of man. The migration was aggravated by the initial change of the cycle which varied from + or - 7 to + or - 11 hours. All test subjects showed a counter-clockwise migration which amounted to a 1.5 hour shift every 4 to 5 days. All test subjects demonstrated functional cerebral changes, decline of psychic productivity, and sleep disorders. The level of those disturbances depended on the value of the initial shift of the sleep-alertness cycle and on the cumulation of the migration effect. Those disorders were noted even when the prechanged sleep-alertness cycle approximated the normal pattern as a result of migration. The results indicate that the migrating day-night pattern, particularly in combination with the initial shift of the sleep-alertness cycle, cannot be recommended for manned space missions. Good health condition and high work capacity of cosmonauts can be maintained, only if a 24-hour sleep-alertness cycle with a normal sleep pattern is provided. G.G.

N79-16527# Joint Publications Research Service, Arlington, Va.

ERGOMETRIC TESTS IN EXPERT MEDICAL CERTIFICATION OF FLIGHT PERSONNEL **c52**

V. V. Zaretskiy, V. M. Kondrakov, and L. Ya. Kolganova *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 77-82 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 58-62 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

In order to assess standard and relative indices of ergometry, exercise tolerance and physical work capacity, 64 members of flight crews with compensated atherosclerotic coronary cardiosclerosis (aged 28 to 56) were examined. The studies were carried out using the Siemens cardiopulmonary complex at rest, at work load of 100 Wt/min for 5 min and during recovery for 10 min. At the initiation of the experiment and during recovery ECG in 12 standard leads was recorded every other minute. With respect to the age and clinical data, the test subjects were subdivided into two groups. Electrocardiographic study revealed insufficiency of coronary circulation in 63.7 percent of the first group and in 80.6 percent of the second group test subjects. Ergometric measurements showed a distinct decrease of the chronotropic, inotropic and aerobic cardiac reserves, especially of the second group test subjects. Ergometric parameters correlated well with the clinical and electrocardiographic data. The results can be used in the diagnostics, evaluation of cardiopulmonary functional and reserve capabilities, and support of expertise recommendations. Author

N79-16528# Joint Publications Research Service, Arlington, Va.

CONCENTRATION OF TRACE CONTAMINANTS DURING GAS CHROMATOGRAPHY AND CHROMATO-MASS SPECTROMETRY IN BIOMEDICAL RESEARCH **c54**

V. I. Ivanov, A. N. Ivanov, G. A. Gaziyev, and L. I. Kobzeva *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 83-86 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 62-64 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

The emission kinetics of carbon dioxide and subsequent accumulation in insulating suits were studied by a sensitive method of gas chromatography, in which carbon dioxide was converted to methane by means of catalytic hydration on a nickel catalyst applied to an INZ-600 carrier, followed by detection of methane on a flame-ionization detector. Maximum conversion of carbon dioxide to methane to 98 percent was obtained at a catalyst temperature of 420-450 C. The threshold of sensitivity of assaying carbon dioxide constituted 0.05 mg/cu m in a l-liter sample. The rate of emission of amines is an important metabolic index of the body. A procedure of preconcentration of trace levels by means of evaporation of an absorbant solution under vacuum was developed.. G.G.

N79-16529# Joint Publications Research Service, Arlington, Va.

EFFECT OF LOW ATMOSPHERIC PRESSURE ON POLYMER OUTGASING **c27**

N. A. Glazkova and V. D. Yablochkin *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 87-89 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 64-65 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

It is established that there is an increase in outgassing of low molecular products from polymers when atmospheric pressure is lowered in an airtight container. The extent of this increase is related to magnitude of atmospheric pressure, temperature and levels of volatile substances in the materials. G.G.

N79-16530# Joint Publications Research Service, Arlington, Va.

EFFECTS OF SPACE FLIGHT FACTORS ON ELECTROLYTE COMPOSITION OF RAT SKELETAL MUSCLES

V. P. Nesterov and R. A. Tigranyan *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 90-94 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 66-68 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Concentration levels of ions of Na, K, Ca and Mg in connective tissues, as well as endogenous media of rats involved in space flight failed to demonstrate appreciable changes in relative ion selectivity. The results indicate that 22-day exposure to space flight factors does not induce appreciable changes in electrolyte composition of rat muscle tissue. G.G.

N79-16531# Joint Publications Research Service, Arlington, Va.

PROSPECTS OF USING JAPANESE QUAIL IN BIOLOGICAL LIFE SUPPORT SYSTEMS c54

Ye. Ya. Shepelev, N. A. Agadzhanyan, V. F. Mishchenko, and V. I. Fofanov *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 95-97 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 69-70 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Analysis of bibliographical distinctions (height, development, egg-laying time and others) and productive qualities (rate of reproduction, egg yield, index of transformation, quality of eggs and meat) of the Japanese quail justifies consideration of the Japanese quail for inclusion as one of the components of heterotrophic organisms in a closed biological life support system. Author

N79-16532# Joint Publications Research Service, Arlington, Va.

EFFECTS OF LBNP ON CATECHOLAMINES AND ADRENAL CORTEX c52

N. F. Kalita and N. A. Davydova *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 98-100 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 70-71 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

The LBNP tests were associated with an appreciable decrease of AC androgenic function, whereas SAS activity one h after the test was characterized by an increase in hormonal activity of the system with subsequent prevalence of mediatory activity one day after the test. These changes warrant the assumption that the LBNP test induces a stress reaction in subjects. Author

N79-16533# Joint Publications Research Service, Arlington, Va.

CORRECTION OF TRANSCAPILLARY EXCHANGE IN MAN UNDER THE INFLUENCE OF ROTATION ON A CENTRIFUGE WHILE IMMERSED IN WATER c52

K. I. Gogolev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 101-104 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 72-74 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

Transcapillary exchange studies in subjects revealed that both background rotation on the centrifuge (3 units +Gz, 5 min) and pure immersion induced a change in fluid shifts and protein fractions between blood and the perivascular space. Thus, the hemodynamic changes occurring in the vascular system during centrifugation prior to immersion led to an increase fluid shift to the interstitial space in the 2d min of the aftereffect period. In the 12th min, there was complete restoration of fluid migration levels; however, there was a change in the shifting of albumins to the opposite direction characterized by passage into the blood stream. G.G.

N79-16534# Joint Publications Research Service, Arlington, Va.

REHABILITATION MEASURES USED TO RESTORE PHYSICAL FITNESS OF MAN AFTER LONG-TERM RESTRICTION OF MOVEMENT c52

B. F. Demida and G. V. Machinskiy *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 105-107 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 74-75 (For primary document see N79-16514 07-51)

Avail: NTIS HC A06/MF A01

A decrease in physical fitness and functional level of the cardiorespiratory system was observed after space flights and ground-based experiments simulating flight conditions. The efficacy of two rehabilitation regimens designed to speedily restore physical fitness and functional level of the cardiorespiratory was evaluated. Physical exercises in a seated position, and in a supine position, were utilized. G.G.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-16535 Houston Univ., Tex.

MATHEMATICAL SIMULATION OF THE HUMAN CIRCULATORY SYSTEM Ph.D. Thesis

Humphrey Hill Hardy 1978 169 p

Avail: Univ. Microfilms Order No. 7901186

A digital model of the human circulatory system was developed which simulates pulsatile blood flow and gas transport and exchange. The model was designed specifically to study short term G stress encountered in modern aerial combat maneuvers and incorporates a realistic representation of the nonlinear elastic characteristics of circulatory elements and the related pressure dependent flow resistance characteristic of these elements. One form for the pressure-volume relationship used in the model was shown to fit in vivo data for arteries, veins, and left atrium. The resistance-pressure relationship which follows using the Poiseuille-Hagen formula was shown to fit lung data. The oxygen saturation curve and the carbon dioxide dissociation curve were represented by published equations. The systemic circulation is partitioned into four zones: head, upper torso, lower torso, and legs; while the pulmonary circulation is partitioned into six zones with a corresponding distribution of ventilation. This model has been shown to properly simulate experimental human data for passive breathing in a prone subject. The computed carbon dioxide and oxygen partial pressures vary realistically around measured average partial pressures from human subjects. The computed blood pressure-time, volume-time, and flow-time curves match corresponding curves for human data. Under sinusoidal G sub z variations, the model predicts realistic variations of body segment volumes, flows and pressures. Dissert. Abstr.

N79-16536 West Virginia Univ., Morgantown.

AN INVESTIGATION TO DETERMINE THE EFFECT OF PHYSICAL CONDITIONING UPON FIBRINOLYTIC REACTIVITY IN NORMAL YOUNG MEN Ph.D. Thesis

Marguerite Kersey Carman 1978 84 p

Avail: Univ. Microfilms Order No. 7900861

The intent of this study was to determine if the fibrinolytic reactivity, or percent change in response to exercise, could be conditioned through an aerobic training program. Thirty-five undergraduate male subjects between the ages of seventeen and twenty-two volunteered for the study. Twenty-seven subjects were randomly assigned to the experimental group while the remaining eight made up the control group. The experimental group engaged in an aerobic conditioning program from four to five weeks completing a total of twenty-five miles. At least one mile was run per session. Fibrinolytic activity improves with aerobic conditioning as coagulation becomes less accelerated post-exercise. After aerobic conditioning, subjects have a lower resting heart rate and are able to increase the work load with the same amount of stress to the body. When subjects become less active there is a decrease in fibrinolytic reactivity, an increase in resting heart rate, and a decreased ability to work with the same amount of stress to the body. Dissert. Abstr.

N79-16537 Case Western Reserve Univ., Cleveland, Ohio.

SYNCHRONOUS BRAIN EVOKED POTENTIAL CORRELATES OF DIRECTED ATTENTION IN HUMANS Ph.D. Thesis

Thomas Francis Collura 1978 68 p

Avail: Univ. Microfilms Order No. 7901509

Synchronous filtering of EEG evoked potentials is a sensitive new tool for the study of dynamic sensory brain processes; through a multi-evoked potential approach, several different brain

centers and processes can be monitored in parallel and in real time using the signal from a single electrode location. In these studies, the relationship between evoked potentials and selective attention is studied in 10 subjects who voluntarily control their attention in order to perform well in a difficult sensory discrimination task. Evoked potential records provide information regarding attention, general arousal, and learning, allowing these processes to be effectively detected and quantified. Dissert. Abstr.

N79-16538 Utah Univ., Salt Lake City.
NUMERICAL STUDIES OF ABSORPTION OF ELECTROMAGNETIC ENERGY BY MAN Ph.D. Thesis
Mark Joseph Hagmann 1978 167 p
Avail: Univ. Microfilms Order No. 7901556

A new synthesis procedure was developed for the design of antenna arrays where stepwide variation is desired in the radiation pattern. The new procedure was used to design a waveguide slot array for use in microwave biological effects research. Useful convergence criteria were established for moment method solutions in electromagnetics. New procedures were developed for improving convergence in two-dimensional solutions in electromagnetics. Interpolants were developed which improve convergence in three-dimensional problems. A realistic model of man was made using an array of 180 cubical cells to represent the form of the 50th percentile standard man. Ground, reflector, and multibody effects were treated numerically with models of man for the first time. Dissert. Abstr.

N79-16539 Wake Forest Univ., Winston-Salem, N.C.
A TRANSIENT ANALYSIS OF THE CEREBROVASCULAR RESPONSE TO CARBON DIOXIDE Ph.D. Thesis
David Allen Wilson 1978 221 p
Avail: Univ. Microfilms Order No. 7901550

The importance of carbon dioxide (CO2) in the regulation of cerebral blood flow is well recognized, yet little information is available regarding the time-dependent factors which may influence the relationship between CO2 and cerebral blood flow (CBF) in the dynamic state. The present studies were designed for the purposes of determining if CBF is directly related in time to arterial partial pressure of CO2 (PaCO2) during a forced change in PaCO2, and if not, then to further study the effects of additional factors which might be important influences on the dynamic relationship between CBF and CO2. The findings provide the framework for a concept of the functional aspects of CBF control. This concept was presented in the form of a single compartment model for the acute regulation of tissue PCO2, by blood flow using a proportional form of control in which it was assumed that cerebrovascular resistance was a linear function of tissue PCO2. The steady-state and nonsteady-state relationships between PaCO2, PvCO2, and CBF were reasonably well approximated by this model. Dissert. Abstr.

N79-16540 California Univ., Los Angeles.
A CORRELATION OF THE EFFECTS OF CATIONIC UNCOUPLERS ON INTACT CARDIAC MUSCLE AND ON CALCIUM BOUND TO ISOLATED CARDIAC MUSCLE PLASMA MEMBRANES Ph.D. Thesis
Donald Martin Bers 1978 151 p
Avail: Univ. Microfilms Order No. 7901335

The concentration of Ca (+2) surrounding the myofibrils determines the force of contraction in muscle cells. The strength of cardiac muscle contraction depends directly on the extracellular Ca(+2) concentration up to about 12 mM and is rapidly decreased upon exposure to La(+3). This, in conjunction with much other data, has led to the hypothesis that Ca(+2) bound to superficial sites in the mammalian myocardium control cardiac contractility. The aim of this study is to gain insight into the localization of contractile-dependent Ca(+2) in cardiac muscle, particularly with regard to the cardiac sarcolemma. A procedure was developed for the isolation of cardiac sarcolemma vesicles. These vesicles are purified about 10 fold (with respect to the tissue homogenate) in K(+)-stimulated p-nitrophenyl phosphatase, Na(+)-K(+)-ATPase, 5'nucleotidase activities and sialic acid content, all of which are believed to be components of the sarcolemma. Dissert. Abstr.

N79-16541*# West Florida Univ., Pensacola.
PERSONNEL NEUTRON MONITORING IN SPACE
Hermann J. Schaefer 1 Nov. 1978 22 p refs
(Contract NAS9-15417)
(NASA-CR-151865) Avail: NTIS HC A02/MF A01 CSCL 06B

A brief review is presented of available information on the galactic neutron spectrum. An examination is made of the difficulties encountered in the determination of the dose equivalent of neutron recoil protons in the presence of a substantially larger background of trapped and star-produced protons as well as other ionizing particles in space. L.S.

N79-16542*# Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Dept. of Physiology.
SPECIALIZED PHYSIOLOGICAL STUDIES IN SUPPORT OF MANNED SPACE FLIGHT Final Report
U. C. Luft, J. A. Loeppky, M. D. Venters, and Y. Kobayashi Dec. 1978 176 p refs
(Contract NAS9-15483)
(NASA-CR-151876) Avail: NTIS HC A09/MF A01 CSCL 06P

The effects of a diuretic (Lasix) induced dehydration on the cardiovascular and hematological responses to lower body negative pressure (LBNP) were analyzed and compared to previous observations on dehydration following exercise in the heat. During LBNP runs the subjects were monitored for changes in blood volume, heart rate, blood pressure, and variations in the volume of the left calf. It was concluded that Lasix dehydration produced a depletion of the body electrolytes at the expense of both the plasma and extravascular compartments. Striking differences were found between those subjects who were physically active (Runners: R) and those who did not engage in any regular physical activity (Non-runners: NR). Tolerance to LBNP (Torr x min) was significantly lower in the R's than the NR's before and after dehydration, however the R's lost more of their tolerance after dehydration with Lasix than after exercise in the heat for about the same fluid loss. The opposite was true for the NR's. Two factors appear to be responsible for the lower LBNP tolerance in R's: parasympathetic inhibition of cardiac activity during LBNP and a greater propensity to pool blood in the lower extremities. G.G.

N79-16543*# Denver Research Inst., Colo.
HYBRIDIZATION OF BIOMEDICAL CIRCUITRY Final Report
George A. Rinard 20 Dec. 1978 87 p
(Contract NAS9-15206)
(NASA-CR-151874; DRI-2691) Avail: NTIS HC A05/MF A01 CSCL 06B

The design and fabrication of low power hybrid circuits to perform vital signs monitoring are reported. The circuits consist of: (1) clock; (2) ECG amplifier and cardiotachometer signal conditioner; (3) impedance pneumobraph and respiration rate processor; (4) hear/breath rate processor; (5) temperature monitor; and (6) LCD display. G.G.

N79-16544*# Battelle Pacific Northwest Labs., Richland, Wash. Occupational and Environmental Safety Dept.
KINETIC MEASUREMENTS OF BONE MINERAL METABOLISM: THE USE OF Na-22 AS A TRACER FOR LONG-TERM BONE MINERAL TURNOVER STUDIES Final Report, 7 Apr. - 30 Nov. 1978
H. E. Palmer 30 Nov. 1978 24 p refs
(Contracts NAS9-15544; NAS9-14248; NASA Order A-13044-B(KT))
(NASA-CR-151868) Avail: NTIS HC A02/MF A01 CSCL 06P

Sodium-22 was studied as a tracer for bone mineral metabolism in rats and dogs. When incorporated into bone during growth from birth to adulthood, the bone becomes uniformly tagged with (22)Na which is released through the metabolic turnover of the bone. The (22)Na which is not incorporated in the bone matrix is rapidly excreted within a few days when animals are fed high but nontoxic levels of NaCl. The (22)Na tracer can be used to measure bone mineral loss in animals during space flight and in research on bone disease. Author

N79-16545# Gould, Inc., Oxnard, Calif. Measurements System Div.

DEVELOPMENT OF AN ELECTRICAL ENERGY CONVERTER FOR CIRCULATORY DEVICE Final Report, 20 May 1977 - 9 Jun. 1978

J. A. Chambers, L. A. Davies, L. M. Mahler, and T. T. Yen Jun. 1978 353 p refs
(Contract N01-HV-4-2906)
(PB-286738/0; NIH-N01-HV-4-2906-5) Avail: NTIS HC A16/MF A01 CSCL 06L

Components for seven energy converters are completed. Four station ferro-fluid seal test fixture is completed. Improved motors, now considered standard, increased converters efficiency 45.5 percent to 55.87 percent. In-vitro tests included lubrication studies, pneumatic blood pump actuation, bladder influence on pump fill, influence of assist springs on inflow to blood pump, and extensive testing on pump actuation pads. All in-vivo control systems are completed. Results of 23 in-vivo tests show good left ventricular pressure reduction and capture of full cardiac output. GRA

N79-16546# Environmental Research Lab., Duluth, Minn.

PROCEEDINGS OF THE FIRST AND SECOND USA-USSR SYMPOSIA ON THE EFFECTS OF POLLUTANTS UPON AQUATIC ECOSYSTEMS. VOLUME 1: USA SYMPOSIUM. VOLUME 2: USSR SYMPOSIUM

Aug. 1978 413 p refs Symp. held at Duluth, Minn., 21-23 Oct. 1975 and at Borok USSR, 22-26 Jun. 1976 Prepared in cooperation with Academy of Sciences (USSR), Borok
(PB-287219/0; EPA-600/3-78-076-Vol-1; EPA-600/3-78-076-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 06T

Broadly based review papers, designed to familiarize attendees with a wide cross-sectional representation of ecologically related activities in each country, and narrowly specific state-of-the-art scientific discussions are presented. The presentations focus upon methodology, historical aspects, microbial and abiotic degradation processes, trace metal problems, effects of toxicants, proposed species indices, and studies of fate and transport of pollutants. GRA

N79-16547# Midwest Research Inst., Minnetonka, Minn. North Star Div.

EVALUATION OF FLUOROPOLYMER MEMBRANES IN OXYGENATORS Final Report, 15 Aug. 1976 - 14 Dec. 1977

Robert J. Petersen, Michael J. Steuck, and Paulette Y. Johnston Sep. 1978 49 p refs
(Contract N01-HV-6-2912)
(PB-286698/6; NIH-N01-HV-6-2912-2) Avail: NTIS HC A03/MF A01 CSCL 06L

Development of a novel, thromboresistant biomaterial, fluorinated ethylcellulose (FEC), for use in membrane oxygenators was continued. Thin film composite membranes of FEC on Celgard microporous polypropylene film were fabricated in quantity under clean room conditions. Techniques were developed for fabrication of high performance spiral-coil membrane oxygenators, and initial tests were performed using lambs as the experimental animal. Oxygen-to-blood transfer rates up to 50 ml/min at 1000 ml/min blood flow through 0.8-square-meter devices were achieved under specific operating conditions. Additional studies on the blood compatibility of FEC further confirmed its high thromboresistance, very low hemolysis rate, and low level of interaction with blood platelets. GRA

N79-16515# Joint Publications Research Service, Arlington, Va.

EFFECT OF 49-DAY SPACE FLIGHT ON PARAMETERS OF IMMUNOLOGICAL REACTIVITY AND PROTEIN COMPOSITION OF BLOOD IN THE CREW OF SALYUT-5

Ye. V. Guseva and R. Yu. Tashpulatov *In its* Space Biol. and Aerospace Med. Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 1-7 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med., no. 1, (Moscow) 1979 p 1-7 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16520# Joint Publications Research Service, Arlington, Va.

ANTIORTHOSTATIC HYPOKINESIA AS AN APPROXIMATE MODEL OF WEIGHTLESSNESS

V. M. Mikhaylov, V. P. Alekseya, M. P. Kuzmin, and E. I. Matsnev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 29-35 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 23-28 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16521# Joint Publications Research Service, Arlington, Va.

BIOELECTRICAL ACTIVITY OF THE BRAIN DURING 49-DAY ANTIORTHOSTATIC HYPOKINESIA IN INDIVIDUALS WITH EARLY SIGNS OF VEGETOVASCULAR DYSFUNCTION

D. A. Alekseyev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 36-43 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 28-34 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16526# Joint Publications Research Service, Arlington, Va.

EFFECTS OF PROLONGED UNIDIRECTIONAL SHIFT OF SLEEPING-WAKING CYCLE ON PHYSIOLOGICAL FUNCTIONS, MENTAL PRODUCTIVITY AND SLEEP OF MAN

A. N. Litsov *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 70-76 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 53-58 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16527# Joint Publications Research Service, Arlington, Va.

ERGOMETRIC TESTS IN EXPERT MEDICAL CERTIFICATION OF FLIGHT PERSONNEL

V. V. Zaretskiy, V. M. Kondrakov, and L. Ya. Kolganova *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 77-82 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 58-62 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16532# Joint Publications Research Service, Arlington, Va.

EFFECTS OF LBNP ON CATECHOLAMINES AND ADRENAL CORTEX

N. F. Kalita and N. A. Davydova *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 98-100 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 70-71 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16533# Joint Publications Research Service, Arlington, Va.

CORRECTION OF TRANSCAPILLARY EXCHANGE IN MAN UNDER THE INFLUENCE OF ROTATION ON A CENTRIFUGE WHILE IMMERSED IN WATER

K. I. Gogolev *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 101-104 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 72-74 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16534# Joint Publications Research Service, Arlington, Va.

REHABILITATION MEASURES USED TO RESTORE PHYSICAL FITNESS OF MAN AFTER LONG-TERM RESTRICTION OF MOVEMENT

B. F. Demida and G. V. Machinskiy *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 105-107 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 74-75 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-16548# Civil Service Commission, Washington, D.C. Personnel Research and Development Center.
SOME VARIATIONS ON DERIVATIONS BY PRIMOFF AND THEIR EXTENSIONS Final Report
Vern W. Turry Aug. 1978 13 p
(PB-287298/4; TN-78-3) Avail: NTIS HC A02/MF A01 CSCL 05J

The statistical properties of J-coefficients were examined, and their identities with standard statistical expressions were established. A new formula was introduced to provide a computational saving. The original J-coefficient methodology was extended to enable new applications of synthetic validation. These extensions provide formulas for the synthetic validity of: an unweighted battery of conventional tests; an optimally weighted battery of conventional tests; and an optimal weighting of tailored tests constructed from several item banks. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-16549 Virginia Univ., Charlottesville.
A TRADE-OFF ANALYSIS DESIGN TOOL: AIRCRAFT INTERIOR NOISE-MOTION/PASSENGER SATISFACTION MODEL Ph.D. Thesis
Ashok Narasimhaiya Rudrapatna 1977 215 p
Avail: Univ. Microfilms Order No. 7901168

A design tool was developed to enhance aircraft passenger satisfaction. It can be used by systems designers for conducting tradeoff analyses of future aircraft interior environments and for evaluating existing aircraft. The effect of aircraft interior motion and noise on passenger comfort and satisfaction has been modelled. The effects of individual aircraft noise sources have been accounted for. Further, the impact of noise on passenger activities and noise levels to safeguard passenger hearing have been investigated. The motion-noise effect models not only provide a means for tradeoff analyses between noise and motion variables, but they also provide a framework for optimizing noise reduction among noise sources. The data for the models have been collected on-board commercial aircraft flights and specially scheduled (flight and ground) tests. Dissert. Abstr.

N79-16550*# GARD, Inc., Niles, Ill.
FOUR-MAN RATED DUAL CATALYST SYSTEM FOR THE RECOVERY OF WATER FROM URINE Final Report
P. Budininkas Nov. 1978 46 p
(Contract NAS2-9715)
(NASA-CR-152227) Avail: NTIS HC A03/MF A01 CSCL 06K

The catalytic system was integrated with a 4-man rated urine wick evaporator. During operation, urine vapor produced by the wick-evaporator was treated in the catalytic system to remove ammonia and volatile hydrocarbons, and water was recovered by condensation in a water cooled condenser. The system operated completely automatically and required no manual adjustments, except periodic supply of urine and removal of the recovered water. Although the system was designed for treating 0.325 kg urine per hour, this rate could be achieved only with a fresh wick, then gradually decreased as the wick became saturated with urine solids. The average urine treatment rates achieved during each of the three endurance tests were 0.137, 0.217, and 0.235 kg/hr. The quality of the recovered water meets drinking water standards, with the exception of a generally low pH. G.G.

N79-16551*# Systems Control, Inc., Palo Alto, Calif.
HUMAN OPERATOR IDENTIFICATION MODEL AND RELATED COMPUTER PROGRAMS Final Report
K. M. Kessler and J. N. Mohr Dec. 1978 145 p
(Contract NAS2-9754)
(NASA-CR-152237) Avail: NTIS HC A07/MF A01 CSCL 05H

Four computer programs which provide computational assistance in the analysis of man/machine systems are reported. The programs are: (1) Modified Transfer Function Program (TF); (2) Time Varying Response Program (TVSR); (3) Optimal Simulation Program (TVOPT); and (4) Linear Identification Program (SCIDNT). The TV program converts the time domain state variable system representative to frequency domain transfer function system representation. The TVSR program computes time histories of the input/output responses of the human operator model. The TVOPT program is an optimal simulation program and is similar to TVSR in that it produces time histories of system states associated with an operator in the loop system. The differences between the two programs are presented. The SCIDNT program is an open loop identification code which operates on the simulated data from TVOPT (or TVSR) or real operator data from motion simulators. G.Y.

N79-16552*# Essex Corp., Huntsville, Ala.
EARTH ORBITAL TELEOPERATOR SYSTEMS EVALUATION Year End Report, 1978
Nicholas Shields, Jr., Phillip H. Slaughter, Ronald G. Brye, and David E. Henderson 1 Feb. 1979 126 p refs
(Contract NAS8-31848)
(NASA-CR-150912; H-79-02) Avail: NTIS HC A07/MF A01 CSCL 05H

The mechanical extension of the human operator to remote and specialized environments poses a series of complex operational questions. A technical and scientific team was organized to investigate these questions through conducting specific laboratory and analytical studies. The intent of the studies was to determine the human operator requirements for remotely manned systems and to determine the particular effects that various system parameters have on human operator performance. In so doing, certain design criteria based on empirically derived data concerning the ultimate control system, the human operator, were added to the Teleoperator Development Program. G.Y.

N79-16553*# Martin Marietta Corp., Denver, Colo.
MANNED MANEUVERING UNIT: USER'S GUIDE
J. A. Lenda May 1978 73 p
(Contract NAS9-14593)
(NASA-CR-151864; MCR-78-517) Avail: NTIS HC A04/MF A01 CSCL 05H

The space shuttle will provide an opportunity to extend and enhance the crew's inherent capabilities in orbit by allowing them to operate effectively outside of their spacecraft by means of extravehicular activity. For this role, the shuttle crew will have a new, easier to don and operate space suit with integral life support system, and a self-contained propulsive backpack. The backpack, called the manned maneuvering unit, will allow the crew to operate beyond the confines of the Shuttle cargo bay and fly to any part of their own spacecraft or to nearby free-flying payloads or structure. This independent mobility will be used to support a wide variety of activities including free-space transfer of cargo and personnel, inspection and monitoring of orbital operations, and construction and assembly of large structures in orbit. J.A.M.

N79-16554*# Texas Center for Research, Austin.
SIMPLE MODELS FOR THE SHUTTLE REMOTE MANIPULATOR SYSTEM Final Report
W. T. Fowler, B. D. Tapley, and B. E. Schutz [1978] 63 p
(Contract NAS9-15385)
(NASA-CR-151881) Avail: NTIS HC A04/MF A01 CSCL 05H

The investigation is aimed at establishing a series of simple models which can be used to study the forces and moments which occur due to the reaction control system (RCS) jet plume firings during a deployment or retrieval of an IUS type payload. The models considered in this investigation are primarily planar in nature. In this study primary attention is given to the roles

the payload play in determining the overall moments on the remote manipulator system arm. L.S.

N79-16555# Royal Naval Personnel Research Committee, London (England).
HUMAN FACTORS. SPEECH COMMUNICATION
A. Carpenter Mar. 1978 35 p refs
(PS-5/78; BR63434) Avail: NTIS HC A03/MF A01

Electrical transmission of speech is discussed in terms of improving the communication media. Understanding and a quicker exchange of ideas is emphasized. Human factors are considered. J.M.S.

N79-16556# Rhode Island Univ., Kingston.
GENERAL METHODS TO ENABLE ROBOTS WITH VISION TO ACQUIRE, ORIENT, AND TRANSPORT WORKPIECES
Progress Report, 15 Aug. 1977 - 15 Jul. 1978
J. Birk, R. Kelley, L. Wilson, V. Badami, and T. Browell 15 Jul. 1978 237 p refs
(Grant NSF APR-74-13935)
(PB-287199/4; NSF/RA-780260; PR-4) Avail: NTIS HC A11/MF A01 CSCL 13H

An experimental robot is described which uses vision to acquire arbitrarily oriented workpieces from a bin and to compute workpiece orientation in the hand, and then transports the piece so that it assumes a predetermined pose at a goal site. The experimental system is operational although many ideas to improve performance need to be tested. Papers presented at conferences on the following topics are discussed in the appendices: workpiece transportation by robots using vision, image feature extraction using diameter limited gradient direction histograms; identification of object symmetry from multiple views, acquiring workpieces; URI Mark IV Arm, three axis rotary joint wrist and Anorad XYZ Tables; kinematic equations for the URI Mark IV Arm and the arm joint solution; surface adapting vacuum gripper; camera alignment; gage for measuring workpiece pose; software descriptions; proposed solution to the continuous pose estimation problem; and breakaway system. Appendices constitute the bulk of the text. GRA

N79-16557# National Fire Prevention and Control Administration, Washington, D. C.
PROTECTIVE CLOTHING AND EQUIPMENT FOR FIREFIGHTERS: CURRENT STANDARDS AND PRACTICES
Final Report
Andrew F. Sears and Edward V. Clougherty Aug. 1978 38 p refs
(PB-286990/7) Avail: NTIS HC A03/MF A01 CSCL 06Q

An assessment of the state-of-the-art in protective clothing and equipment for the firefighter is provided, with a description of relevant standards which fire departments can use in developing purchase specifications. Areas covered by the report are: helmets, face shields and goggles, fire coats and trousers, boots and shoes, gloves, station uniforms, and respiratory protective devices. GRA

N79-16558# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
ADVANCED INDUSTRIAL ROBOT CONTROL SYSTEMS
Technical Report, 1 Jul. 1977 - 1 Jan. 1978
R. Paul, J. Luh, J. Bender, R. Brown, and M. Remington May 1978 94 p refs
(Grant NSF APR-77-14533)
(PB-287273/7; TR-EE78-25; NSF/RA-780167) Avail: NTIS HC A05/MF A01 CSCL 13H

Industrial robot control schemes to improve the performance of currently available robots are developed. The need to extend the flexibility and usefulness of current industrial robots and to provide a solid base for future advanced systems based on computer control techniques and dynamic manipulation models are examined. This report describes the work performed during the first six months since the project's inception. GRA

N79-16559# Scientific Systems, Inc., Cambridge, Mass.
MICROPROCESSOR: BASED PROSTHETIC CONTROL
Final Report
Donald E. Gustafson and P. C. Doerschuk Apr. 1978 97 p refs
(Grant NSF APR-77-19672)
(PB-286652/3; NSF/RA-780068) Avail: NTIS HC A05/MF A01 CSCL 06L

The feasibility of using advanced techniques in a multifunction prosthesis was investigated. The specific problem area addressed is industrial productivity, which is presently quite limited for people using prosthetic devices. A preliminary feasibility analysis of multifunction discrimination using myoelectric signals, a method which has not yet been reduced to practice was made. The present approach specifically is designed to ameliorate these difficulties and uses a newly-developed pattern recognition technique which offers great speed and has desirable statistical optimality properties. GRA

N79-16560# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
OPTIMISATION OF PILOT CAPABILITY AND AVIONIC SYSTEM DESIGN
F. S. Stringer, ed. Nov. 1978 95 p refs
(AGARD-AR-118; ISBN-92-835-1292-8) Avail: NTIS HC A05/MF A01

The objective of the Group was to prepare a joint report which would guide future combat aircraft and system designers to achieve a better blend of aircrew and machine. For individual titles, see N79-16561 through N79-16568.

N79-16561# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
OPTIMISATION OF PILOT CAPABILITY AND AVIONIC SYSTEM DESIGN, INTRODUCTION
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 4 p (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

The main objectives are to curb the continued development of more sophisticated equipment which disregards the human factors, to examine the aircrew potential, and to suggest how the latter could be better exploited to satisfy the operational requirements. The crew capabilities and limitations are examined, and then methods are devised to match the system to these capabilities. Training methods that will best exploit aircrew capabilities are discussed. L.S.

N79-16562# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HUMAN CAPABILITIES
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 6 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

A brief description is given of man's capabilities. A bibliography is provided to allow more detailed study of specific aspects. Author

N79-16563# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SYSTEMS DESIGN
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 18 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

It is pointed out that in designing man machine subsystems, technology offers many similar solutions in answer to each partial problem and as a result design decisions are liable to be taken on a limited number of possible alternatives open to analysis, thus sometimes giving rise to vague criteria. It is stressed that systematic analysis techniques are needed to combat this problem. L.S.

N79-16564# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PILOT WORKLOAD QUALIFICATION FOR AVIONICS DESIGN
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 8 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

Recent avionics development has been in the direction of increasing complexity, cost, and separation of aircraft control

from the human pilot. One current underlying philosophy in avionics design seems to be to remove aircraft control from the human pilot whenever the required profile requires him to handle flight information at a rate beyond his inherent capability. This philosophy has probably resulted in avionics over-automation. A properly posed avionics system design problem should include human capability constraints cast in systems engineering terms. It is this modelling of human capability which is treated here. Author

N79-16565# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TRAINING IMPLICATIONS
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 12 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

The fascination with technology resulted in a tendency to optimize the equipment portion of a system, sometimes almost to exclusion of considerations for the human who must operate the system. This trend toward automation and sophisticated equipment has apparently contributed to the ever-increasing cost of aircraft. The purpose here is to review the concept of reducing the level of automation and increasing the responsibility for task completion to the man in the man-machine loop and possible implications for training. Author

N79-16566# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE DESIGN OF AIR COMBAT AIRCRAFT
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 16 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

Various ways are suggested in which the crew station designer could reduce avionics complexity and costs, depending upon the aircraft mission. The air combat aircraft is taken as an example. Firstly, the combat aircraft missions are described. Then some of the associated problems are considered, followed by suggested methods to reduce complexity and cost of the avionics of this type of aircraft. Methods used in the design of the total aircraft system, are discussed subsequently together with the system tradeoffs the designer must face. Conclusions and recommendations for future research are then offered. Author

N79-16567# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
GROUND ATTACK
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 7 p (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

The ground attack aircraft missions are described. Some of the associated problems are considered, followed by suggested methods to reduce complexity and cost of the avionics of this type of aircraft. Methods used in the design of the total aircraft system, are discussed together with the system tradeoffs the designer must face. L.S.

N79-16568# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE HELICOPTER
In its Optimisation of Pilot Capability and Avionic System Design Nov. 1978 9 p refs (For primary document see N79-16560 07-54)
Avail: NTIS HC A05/MF A01

The main theme of this discussion on helicopters is the optimisation of the balance between human capability and system automation with the object of providing the most effective operational system and the most cost effective designs of both helicopter and equipment. Author

N79-16528# Joint Publications Research Service, Arlington, Va.
CONCENTRATION OF TRACE CONTAMINANTS DURING GAS CHROMATOGRAPHY AND CHROMATO-MASS SPECTROMETRY IN BIOMEDICAL RESEARCH
V. I. Ivanov, A. N. Ivanov, G. A. Gaziyev, and L. I. Kobzeva *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 83-86 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 62-64 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16531# Joint Publications Research Service, Arlington, Va.
PROSPECTS OF USING JAPANESE QUAIL IN BIOLOGICAL LIFE SUPPORT SYSTEMS
Ye. Ya. Shepelev, N. A. Agadzhanyan, V. F. Mishchenko, and V. I. Fofanov *In its* Space Biol. and Aerospace Med., Vol. 13, No. 1, 1979 (JPRS-72826) 14 Feb. 1979 p 95-97 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 1, 1979 p 69-70 (For primary document see N79-16514 07-51)
Avail: NTIS HC A06/MF A01

N79-16793# Joint Publications Research Service, Arlington, Va.
ANTIRADIATION SUIT AND OTHER SPECIAL CLOTHING AT INDUSTRIAL SAFETY EXHIBITION
D. Pipko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 55 (JPRS-72716) 29 Jan. 1979 p 23-26 Transl. into ENGLISH from Sots. Industriya (Moscow), 7 Dec. 1978 p 4 (For primary document see N79-16792 07-99)
Avail: NTIS HC A05/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N79-16569 Cornell Univ., Ithaca, N. Y.
INFORMATION FLOW IN PARALLEL PROGRAMS: AN AXIOMATIC APPROACH Ph.D. Thesis
Richard Philip Reitman 1978 180 p
Avail: Univ. Microfilms Order No. 7902288

The problem of developing an axiomatic logic that captures the information flow semantics of a program is addressed. Information flow analysis is extended from terminating sequential programs to parallel programs in which non-termination, synchronization and deadlock are possible. Once the information flow generated by a program is determined, it is easy to check whether or not the program satisfies a given security policy. An axiomatic proof system for determining the flow of information produced by sequential or parallel programs is developed. The practicability of the method is demonstrated by developing the flow semantics for Concurrent Pascal. Dissert. Abstr.

N79-16570 Texas A&M Univ., College Station.
COMPARATIVE ANALYSIS OF ERROR DETECTION AND RECOVERY IN SYNTAX DIRECTED COMPILERS Ph.D. Thesis
Abdulaziz Nassir Sagr 1978 187 p
Avail: Univ. Microfilms Order No. 7901004

This comparative analysis covers LL(1) and SLR(1) recovery algorithms with and without backtracking. Error detection and recovery methods of simple precedence parser, PL/C, and PL/1 are also analyzed and compared. Local and global recovery methods were associated with each parsing algorithm. Local algorithms replace, delete, or insert symbols in the input stream. Global recovery changes the stack, the input, or both in order to recover. A recovery methodology is also presented for LL(1) parsing algorithm. This method allows the recovery to take place only if the input symbol is guaranteed to be shifted by the parser. In practical comparisons, 800 pseudo-programs are submitted to each algorithm with errors ranging from one to eighty. The output of each compilation process is collected. The evaluation of this output has been illustrated in both quantitative and ranking analysis. Dissert. Abstr.

N79-16571# Admiralty Surface Weapons Establishment, Portsmouth (England).
MODBUS: A STANDARD COMPUTER BUS STRUCTURE
T. D. Wells Feb. 1978 29 p refs
(TR-78003; DRIC-BR63238) Avail: NTIS HC A03/MF A01

A computer internal highway proposed for use as an MOD(N) standard is described. In addition, the design of an LSI interfacing set currently under development, and the user interface are presented. F.O.S.

N79-16572# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: PROCEEDINGS OF 14TH COMPUTER PERFORMANCE EVALUATION USER'S GROUP (CPEUG) Final Report
James E. Weatherbee Oct. 1978 357 p refs Conf. held at Boston, 24-27 Oct. 1978
(PB-287069/9; NBS-SP-500-41) Avail: NTIS HC A16/MF A01 CSCL 09B

The papers are reported that were presented at the Fourteenth Meeting of the Computer Performance Evaluation Users Group (CPEUG) held October 24-27, 1978 in Boston. The technical presentations were organized around the three phases of the ADP Life Cycle: the Requirements Phase (workload definition), the Acquisition Phase (computer system and service selection), and the Operational Phase (performance) measurement and prediction methods. The program of CPEUG 78 is also included and serves as an Appendix to the Proceedings. GRA

N79-16014*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MBASIC BATCH PROCESSOR ARCHITECTURAL OVERVIEW
S. M. Reynolds *In its* The Deep Space Network 15 Dec. 1978 p 82-86 (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-16573 Texas A&M Univ., College Station.
MULTIPLANAR EXTENSION OF NONPLANAR DIRECTED GRAPHS Ph.D. Thesis
Jimmie Archer Moore 1978 149 p
Avail: Univ. Microfilms Order No. 7900993

An analysis of planar and nonplanar aspects of program flow is presented. Basic blocks of computer programs are treated as vertices in a directed graph. Elements of graph theory are given in order to provide the necessary background for the use of graph terminology. Numerous examples of applications of graph theory are presented. A search method known as the Depth First Search (DFS) is a primary technique utilized in many phases. A series of 22 FORTRAN programs are examined for planarity and a table is given summarizing the results. Attempts at correlation of various ratios to nonplanar programs are discussed. Two optimization phases are undertaken in an attempt to minimize the number of crossings in the initial embedded plane and the number of extended planes required for embedding of nonplanar configurations. Specific paths that cross each other are identified by path number. Sufficient information is given for actual multiplanar embedding. Dissert. Abstr.

N79-16574 Houston Univ., Tex.
COMPUTER-ASSISTED OPTIMIZATION IN ANALYTICAL CHEMISTRY Ph.D. Thesis
Lloyd Robinson Parker, Jr. 1978 370 p
Avail: Univ. Microfilms Order No. 7901192

Optimization of a response from an experimental chemical system is shown to be an important tool in analytical chemistry. Both the improvement of the response and the understanding of how the factors or input variables affect that response are important parts of the optimization. Three studies are included: the optimization of resolution in a gas chromatographic system (within a given time constraint); the optimization of sensitivity in a colorimetric continuous-flow method for calcium (while maintaining other responses within certain limits); and the investigation into a method for analysis of phenylephrine, a pharmaceutical compound. The interface built to allow computer control of laboratory instruments is described, and BASIC programs illustrating the use of the computer and interface in the three studies are included. Dissert. Abstr.

N79-16575 Georgia State Univ., Atlanta.
A STUDY OF THE EFFECTS OF COMPUTER GRAPHICS SIMULATION ON GEOMETRIC CONSTRUCTION THEORY Ph.D. Thesis
Charles Graham Hixon, III 1978 109 p
Avail: Univ. Microfilms Order No. 7900129

The classic theory of geometric constructions from a modern viewpoint afforded by the use of interactive computer graphics simulation is studied. This viewpoint was studied to determine if this theory could reveal and isolate the basic capabilities that a construction system must possess in order to be equivalent to the Euclidean Construction System. The results of the examination were also studied to suggest changes in emphasis on the importance of various construction capabilities. The Euclidean Construction System and those systems known to be equivalent to the Euclidean System are examined. The results suggest that certain properties of geometric construction systems and instruments receive increased emphasis. Dissert. Abstr.

N79-16576 West Virginia Univ., Morgantown.
SYNTHESIS OF A GENERAL THRESHOLD ELEMENT Ph.D. Thesis
Abolhassan Modaress-Razavi 1978 87 p
Avail: Univ. Microfilms Order No. 7900889

A synthesis procedure was developed that will realize any given Boolean function with a General Threshold Element (GTE). The term General Threshold Element is used to indicate that the procedure is equally effective with Single Threshold Element realizable functions and Multi-Threshold Threshold Element functions. This procedure is usable on all functions with six or fewer input variables. The synthesis procedure was programmed in FORTRAN IV. In the synthesis procedure, a set of weight vectors that will realize the given function are determined as well as the threshold vector needed. To make the search more effective (less costly in computer time) the relations that exist between weights realizing a function were studied.
Dissert. Abstr.

N79-16577 Kansas Univ., Lawrence.
A NATURAL MODEL FOR CONCURRENT COMPUTATION Ph.D. Thesis
Elizabeth Ann Buschlen Unger 1978 177 p
Avail: Univ. Microfilms Order No. 7824830

An intrinsically concurrent model is described and the major properties of the model are studied. The model's applications are demonstrated in examples, and the model is compared to other models and languages. Dissert. Abstr.

N79-16578 California Univ., Los Angeles.
AN AXIOMATIC SEMANTIC DEFINITION OF ALGOL 68 Ph.D. Thesis
Richard Lee Schwartz 1978 230 p
Avail: Univ. Microfilms Order No. 7901400

The principal contributions are: (1)an axiomatic semantic definition of ALGOL 68; (2)an extension of the axiomatic method to expression-oriented languages; (3)a unified treatment of side-effects, global variables, pointers, procedures as parameters, flexible arrays, and subnames; (4)a treatment of unrestricted aliasing of names; (5)a treatment of collateral elaboration extending work by Owicki on asynchronous parallel processes; (6)a treatment of declarations and full static scope rules; (7)added visibility to the semantic issues present in ALGOL 68; and (8)new insight into language design for verification. Dissert. Abstr.

N79-16579 California Univ., Los Angeles.
A DISTRIBUTED DATA AND CONTROL DRIVEN MACHINE: PROGRAMMING AND ARCHITECTURE Ph.D. Thesis
Wilson Vicente Ruggiero 1978 397 p
Avail: Univ. Microfilms Order No. 7901396

A concurrent multilevel graph model of behavior is utilized to guide the analysis and synthesis of very large distributed multiprocessor networks. Two major aspects of such systems are covered: programming and architecture. Dissert. Abstr.

N79-16580 Texas Univ. at Austin.
INDUCTION AS A BASIS FOR UNDERSTANDING COMPUTER PROGRAMS Ph.D. Thesis
Charles Wilson Reynolds, Jr. 1978 90 p
Avail: Univ. Microfilms Order No. 7900621

The use of induction in defining and proving iterative programs is considered. In particular, inductive definitions and derivative inductive proofs associated with the construction P(X) = WHILE B(X) DO X := S(X) are analyzed. It is shown that the various inductive proofs of partial correctness are immediately, and obviously, derived from corresponding inductive definitions of program semantics, that the various proof techniques are all trivially interchangeable, and finally that every proof of partial correctness is in fact a proof of total correctness. Dissert. Abstr.

N79-16581 State Univ. of New York at Stony Brook.
SYNTAX DRIVEN ERROR RECOVERY IN TOP-DOWN PARSING Ph.D. Thesis
Ajit Babani Pai 1978 87 p
Avail: Univ. Microfilms Order No. 7824692

A relation, called Contig, between the symbols of the language, together with a fixed amount of lookahead, is used to resolve the ambiguity between alternate local corrections. A symbol-specific non-probabilistic notion of syntactic redundancy of a language is defined and transformations on grammars (and hence on languages) which increase or decrease the syntactic redundancy of a language are described. A class of grammars is defined, called UFL phi grammars, and an algorithmic procedure for obtaining a UFL phi grammar from a given unambiguous context free grammar is described. Dissert. Abstr.

N79-16582 Rutgers - The State Univ., New Brunswick, N. J.
MINIMUM COMPARISON MERGING AND MERGING ALGORITHMS Ph.D. Thesis
Paul E. Murphy 1978 151 p
Avail: Univ. Microfilms Order No. 7901296

Suppose we are given two disjoint ordered sets of distinct elements to be merged into a single ordered set. Various aspects of merging ordered sets using binary comparisons are described. The worst case behavior of merging algorithms for sets of approximately equal size was studied. The worst case behavior of all algorithms to merge two ordered sets when one set is of size three was examined. The average performance of a number of merging algorithms was calculated. Bounds on the minimum average peformance of any merging algorithm and an analysis of the expected performance of the generalized binary merging algorithm are included. Dissert. Abstr.

N79-16583 Texas A&M Univ., College Station.
OPTIMIZATION OF LARGE SCALE 0-1 INTEGER LINEAR PROGRAMMING PROBLEMS WITH MULTIPLE-CHOICE CONSTRAINTS Ph.D. Thesis
Nazim Uddin Ahmed 1978 117 p
Avail: Univ. Microfilms Order No. 7900946

In many capital budgeting decision making situations, the decision problem may be formulated as a 0-1 integer linear programming problem with multiple-choice constraints. An example of this formulation is a model of the rehabilitation and maintenance of the Texas State highway system. This research effort has the following primary objectives: (1) to develop an efficient algorithm to solve large scale 0-1 integer programming problems, (several thousand variables) with multiple-choice constraints; and (2) to solve the Texas State highway maintenance and rehabilitation problem. The algorithm is based on an approach called the effective gradient, which is a measure of preference among the solution variables. The multiple-choice constraints, or generalized upper bound constraints are handled implicitly in the algorithmic structure. Dissert. Abstr.

N79-16584 Texas Univ. at Austin.
DISJUNCTIVE COMPLEXITY OF ASSERTIONS AS A MODEL OF PERCEIVED COMPLEXITY OF PROGRAMS Ph.D. Thesis
David Lee Matuszek 1978 314 p
Avail: Univ. Microfilms Order No. 7900604

It has become increasingly important that programs be written in a style which is clear and easy to understand. Structured programming, however, has hitherto dealt primarily with questions of syntax. The notion of structured semantics, which deals with the perspicuity of actions performed, rather than merely with the notation used to express them is presented. A program is semantically structured if it is written to minimize disjunctive complexity. It is shown that mechanical restructuring of programs cannot improve their semantic structure unless code duplication is allowed. Applications to programming style and to programming language design are discussed. Dissert. Abstr.

N79-16585# National Electrical Engineering Research Inst., Pretoria (South Africa).
REAL-TIME INTERACTIVE MULTIPROGRAMMING
A. D. Heher Jun. 1978 311 p refs
(CSIR-SR-ELEK-150; ISBN-0-7988-1345-8) Avail: NTIS HC A14/MF A01

A method of constructing a real-time interactive software system for a minicomputer to enable the interactive facilities to be extended and improved in a multitasking environment which supports structured programming concepts is described. A memory management technique called Software Virtual Memory Management, which is implemented entirely in software, is used to extend the concept of hardware virtual memory management. This extension unifies the concepts of memory space allocation and control and file system management, resulting in a system which is simple and safe for the application oriented user. The memory management structures are also used to provide exceptional protection facilities. A system is implemented using an interpreter and significant improvements in the performance of interpretive systems are shown to be possible using the structures presented. J.M.S.

N79-16586*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A VECTORIZATION OF THE HESS MCDONNELL DOUGLAS POTENTIAL FLOW PROGRAM NUED FOR THE STAR-100 COMPUTER
Lillian R. Boney and Robert E. Smith, Jr. Jan. 1979 16 p
(NASA-TM-78816) Avail: NTIS HC A02/MF A01 CSCL 09B

The computer program NUED for analyzing potential flow about arbitrary three dimensional lifting bodies using the panel method was modified to use vector operations and run on the STAR-100 computer. A high speed of computation and ability to approximate the body surface with a large number of panels are characteristics of NUEDV. The new program shows that vector operations can be readily implemented in programs of this type to increase the computational speed on the STAR-100 computer. The virtual memory architecture of the STAR-100 facilitates the use of large numbers of panels to approximate the body surface. S.E.S.

N79-16587# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 1: A REVIEW OF DIFFERENT DIGITAL IMAGE PREPROCESSING APPROACHES FROM THE SOFTWARE POINT OF VIEW

Luigi Borriello, Giacomo Poscitelli, Nunzio Profido, and Clara Valerio Paris ESA Apr. 1978 126 p refs 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-1) Avail: NTIS HC A07/MF A01

An analysis of possible digital image preprocessing and input/output functions is presented. Preprocessing is referred to image restoration and enhancement for subsequent visual or computerized image analysis and information extraction. Input/output functions consist of image data handling, image display, format conversions, control commands and parameters input, synthetic results output. A general overview of the image processing software state of art is presented. A general survey, containing short descriptions and fundamental characteristics, is given for the most relevant image processing packages. ER-MAN II, IDAMS, LARSYS, PAX and VICAR systems are examined in detail, and analyzed on the basis of the following characteristics: general system features, structural features, and functional features. F.O.S.

N79-16588# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 2: IMAGE PREPROCESSING SOFTWARE EVALUATION AND COMPARISON

Luigi Borriello, Giacomo Piscitelli, Nunzio Profido, and Clara Valerio Paris ESA Apr. 1978 110 p refs 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-2) Avail: NTIS HC A06/MF A01

The software evaluation and comparison criteria are presented. The criteria are then applied to the following image processing software: (1) ER-MAN II, which is the Earth Resources Management System; (2) IDAMS, which is the Image Display and Manipulation System; (3) LARSYS, which is the Laboratory for Application of Remote Sensing System; (4) PAX II, which is the Picture Processing System; and (5) VICAR, which is the Video Image Communication and Retrieval System. A quantitative and qualitative analysis is carried out for each package, and finally an over-all comparison among packages is reported. F.O.S.

N79-16589# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 3, PART 1: AN IMAGE PROCESSING SUPPORT SOFTWARE (IPSS) ANALYSIS AND DESIGN

Luigi Borriello, Giacomo Piscitelli, Nunzio Porfido, and Clara Valerio Paris ESA Apr. 1978 126 p refs 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-3-Pt-1) Avail: NTIS HC A07/MF A01

The analysis of selected IPSS applicative preprocessing functions are presented. Also included are: IPSS analysis, IPSS languages definition, IPSS support functions definition, and IPSS nucleus overview design. F.O.S.

N79-16590# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 3, PART 2: AN IMAGE PROCESSING SUPPORT SOFTWARE (IPSS) ANALYSIS AND DESIGN

Luigi Borriello, Giacomo Piscitelli, Nunzio Porfido, and Clara Valerio Paris ESA Apr. 1978 453 p refs 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-3-Pt-2) Avail: NTIS HC A20/MF A01

The imaging processing support software (IPSS) functional characteristics are described. These include: system features, portability, code and data structure IPSS architecture, usability, and systems analysis. The standards used in the IPSS analysis and design are presented along with digital image formats, and coding conventions. F.O.S.

N79-16591# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 4: ANALYSIS, DESIGN, CODING, TESTING AND DOCUMENTATION OF A SAMPLE PROGRAM. A TEST PATTERN GENERATOR (TPGEN)

Luigi Borriello, Giacomo Piscitelli, Nunzio Porfido, and Clara Valerio Paris ESA Apr. 1978 487 p 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-4) Avail: NTIS HC A21/MF A01

The documentation concerning the Test Pattern Generator development program is presented including external and internal specifications. The following manuals and listings are included: TPGEN installation manual, TPGEN user's manual, Language Generation (LANGEN) procedure listing, Generator of Error messages (GENERR) procedure listing, TPGEN FORTRAN version procedure, and TPGEN Structured FORTRAN version procedure listing. F.O.S.

N79-16592# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 5: SOME REMARKS ON FUTURE IPSS DEVELOPMENT

Luigi Borriello, Giacomo Piscitelli, Nunzio Profido, and Clara Valerio Paris ESA Apr. 1978 12 p 7 Vol.
(Contract ESOC-2800/76-D-IM-SC)
(ESA-CR(P)-1122-Vol-5) Avail: NTIS HC A02/MF A01

The type of effort to build up an image processing support software is discussed including: preliminary analysis, analysis and design, coding, and test and quality control. F.O.S.

N79-16593# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).

IMAGE PROCESSING SUPPORT SOFTWARE STUDY. VOLUME 0: A SHORT STUDY OBJECTIVES, ACTIVITIES METHODOLOGY AND RESULTS DESCRIPTION

Luigi Borriello, Giacomo Piscitelli, Nunzio Porfido, and Clara Valerio Paris ESA Apr. 1978 34 p 7 Vol.
(Contract ESOC-2800/76-D-IM-SC; et al)
(ESA-CR(P)-1122-Vol-0) Avail: NTIS HC A03/MF A01

Specifications for an image processing support software are presented along with the methodological and technical approaches. F.O.S.

N79-16594# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.

FAST FOURIER TRANSFORMS ON ICL 1900 COMPUTERS WITH APPLICATION TO REAL DATA

P. W. James Nov. 1977 22 p ref
(RAE-TM-RAD-NAV-69; BR61427) Avail: NTIS HC A02/MF A01

The design of fast Fourier transform coding for maximum speed on ICL 1900 computers is discussed, with particular reference to the case when the data is real. An execution time of 0.055 s is obtained for a 1024 point transform. Author

N79-16012*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

A SIMPLIFIED ALGORITHM FOR CORRECTING BOTH ERRORS AND ERASURES OF R-S CODES

I. S. Reed (Southern California Univ.) and T. K. Truong *In its* The Deep Space Network 15 Dec. 1978 p 66-71 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

N79-16013*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

EVALUATION OF THE DSN SOFTWARE METHODOLOGY

A. Irvine and M. McKenzie *In its* The Deep Space Network 15 Dec. 1978 p 72-81 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

N79-16015*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

GCF HSD ERROR CONTROL

C. K. Hung *In its* The Deep Space Network 15 Dec. 1978 p 87-93 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N79-16595 California Univ., Los Angeles.
A HIERARCHICAL ROUTING AND FLOW CONTROL (HRFC) POLICY FOR PACKET SWITCHED NETWORKS Ph.D. Thesis
Michael Yih-Chung Shen 1978 185 p
Avail: Univ. Microfilms Order No. 7901402

Simulation results of the behavior and performance of a routing and flow control policy are presented. The simulation includes the study of the cases of uniform traffic, non-uniform traffic, non-stationary traffic and the effect of multi-packet messages. The implementation of the policy is also discussed. Its potential to complement an individual local routing scheme for internet routing and flow control (i.e., source none-source GATEWAY routing and flow control, and GATEWAY-GATEWAY routing) is elaborated. The HRFC policy can also be applied to the environment of packet switching and circuit switching integration. The research concludes that this new policy is simpler to implement and yields better performance than that of the distributed routing algorithm and buffer allocation flow control policies which are currently being used in many packet switched networks. Dissert. Abstr.

N79-16596 Rutgers - The State Univ., New Brunswick, N. J.
A STUDY OF STABILITY IN LINEAR NETWORKS WITH PRESCRIBED CIRCULAR IMPEDANCE REGION TERMINATIONS Ph.D. Thesis
John Douglas Williams 1978 241 p
Avail: Univ. Microfilms Order No. 7901325

An important class of stability problems under generalized terminations is the class of real-frequency stability problems wherein the prescribed regions of impedances at each real frequency are circular. This entire class will be referred to as the prescribed circular impedance region (PCIR) stability problem. A cohesive and extensive study of the PCIR stability problem for the general class of linear, active, time-invariant n-port networks is reported. Several new advances in the attendant real-frequency absolute stability problem are also made. General results are contiguously illustrated through examples and applications from the telecommunications field having from simple to extensive complexities. Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N79-16597 Southern Methodist Univ., Dallas, Tex.
A GENERALIZED MEASURE OF PERFORMANCE - PROPERTIES AND OPTIMIZATION IN A CLASS OF QUEUEING SYSTEMS Ph.D. Thesis
Mohamed A. Shalaby 1978 131 p
Avail: Univ. Microfilms Order No. 7901711

The measure is defined as a weighted combination of the queue length distribution, the weights being general functions of system parameters. Two phases of study are recognized. First, a behavioral study is performed to evaluate and characterize the measure, and then this measure is optimized. The method is applied to the class of multiserver finite queues with general interarrival times and exponential service times (G/M/s/N systems). The structure of the single server system is exploited in full to develop the main results. These results are then applied to the multiserver system. The ratios of the steady state probabilities for the single server system are used to simplify the structure of the multiserver system. Dissert. Abstr.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-16598 Oregon Univ., Eugene.
REPRESENTATIONS AND HARMONIC ANALYSIS OF COMPACT HYPERGROUPS Ph.D. Thesis
Richard Carl Vrem 1978 149 p
Avail: Univ. Microfilms Order No. 7901101

A hypergroup is a generalization of a group where multiplication is allowed to be multivalued. A discussion of the representation theory of locally compact hypergroups is presented. The Fourier transform is defined and shown to be an injective, continuous homomorphism. Analogues of the Riemann Lebesque lemma and Riesz-Fischer theorem are obtained. The inverse Fourier transform is also studied as are certain norm inequalities. An example is given to show that the functions with absolutely convergent Fourier series do not necessarily form a Banach algebra under pointwise operations. A version of Wendel's theorem for arbitrary hypergroups with an invariant measure is obtained and a number of multiplier results are proved. Various lacunarity conditions for compact hypergroups are introduced, including Sidon sets. Dissert. Abstr.

N79-16599 Utah Univ., Salt Lake City.
INTERPOLATION TO ARBITRARILY SPACED DATA Ph.D. Thesis
William Linn Vittitow 1978 80 p
Avail: Univ. Microfilms Order No. 7901555

The goal was to modify Maude's method to remove problems. Problems of bad surface and singular matrix inversion were solved by allowing circle selection with less than six points. This gave, over each circle, a space of quadratics. Freedom to pick a good quadratic gave control over the resulting space. The next problem, circles not covering the domain of interest, was solved by giving an automatic method of covering a domain with circles none of which contain too many points. This method was combined with methods of choice to solve all three problems at once.
Dissert. Abstr.

N79-16600 California Univ., Los Angeles.
MULTINOMIAL DEGREES OF ELEMENTS IN EXTENSION FIELDS Ph.D. Thesis
Malcolm Scott Soule 1978 48 p
Avail: Univ. Microfilms Order No. 7901406

The multinomial degree, d prime sub k (theta), of an element theta of an extension field K with respect to the base field k is the number of nonconstant terms in the polynomial with the least number of terms over k with theta a zero. For the whole extension field K there are two particular multinomial degrees: the maximum multinomial degree d prime or d prime sub K/k, being the maximum of the multinomial degrees of generating elements of K over K; and the minimum multinomial degree, d double prime or d double prime sub K/k, which is the minimum of the multinomial degrees of generating elements of an extension field K over k. The dissertation investigates the set of all possible multinomial degrees of generating elements of an extension field. Dissert. Abstr.

N79-16601 Texas Univ. at Austin.
SAMPLE PATH PROPERTIES OF CONTINUOUS LOCAL MARTINGALES Ph.D. Thesis
Terry Dean Shaw 1978 84 p
Avail: Univ. Microfilms Order No. 7900633

Associated with every continuous local martingale X is a continuous, increasing, previsible process by Doob's Decomposition Theorem. The finite variation random measure plays the same role in stochastic integration with respect to the local martingale X that Lebesgue measure dt (when considered as a random measure) does when integrating with respect to a Brownian motion: It is possible to characterize the stochastic integral by means of a pathwise integral with respect to this finite variation process. A Brownian motion has several interesting path properties. It is also shown that the change of time identifies pathwise the local time of the continuous local martingale X with the local time of a Brownian motion. Dissert. Abstr.

N79-16602 Tulane Univ., New Orleans, La.
ON A CLASS OF LATTICE ORDERED MODULES Ph.D. Thesis
Wayne Bruce Powell 1978 81 p
Avail: Univ. Microfilms Order No. 7901498

The theory of partially ordered groups, rings, and modules are reviewed and examples are developed. The left f-rings, which are the most general type of lattice ordered ring are introduced. Examples of left f-rings are given, and under certain conditions the partially ordered semigroups that produce semigroup rings which are left f-rings are characterized. Singular elements in f-rings were studied. The free f-module over an arbitrary set in the general class of f-modules over a left f-ring was developed. The f-modules which are injective relative to the class of f-modules are discussed. Dissert. Abstr.

N79-16603 Cornell Univ., Ithaca, N. Y.
APPROXIMATIONS FOR PARABOLIC EQUATIONS WITH TIME DEPENDENT COEFFICIENTS Ph.D. Thesis
Peter Henry Sammon 1978 102 p
Avail: Univ. Microfilms Order No. 7902291

Approximations to the solutions of homogeneous intial boundary value problems are developed for parabolic equations with time dependent coefficients. Conditions are given (which can be verified for various Galerkin type methods) that guarantee optimal order errors down to the initial time if the initial data are compatible. Optimal order errors are also demonstrated for positive times even if the initial data are not smooth. Results are then discussed for high order time discretizations of the semidiscrete equation that are based in a natural way on rational approximations to the exponential function. Conditions are given that lead to optimal order errors if compatible initial data are used. It is shown how these methods can lose accuracy if the initial data are not smooth, in marked contrast to known results for the time independent coefficients case. Dissert. Abstr.

N79-16604 Polytechnic Inst. of New York.
ON THE PLAT SUBGROUP OF THE BRAID GROUP Ph.D. Thesis
Martin Teddy Schechter 1978 64 p
Avail: Univ. Microfilms Order No. 7816642

A simplified list of generators for the plat subgroup is obtained together with a semi-direct product decomposition. A list of relations holding among these generators is given. The induced representation on the plat subgroup is considered. By factoring out a free Abelian group of rank 3 from the group of representing matrices and by identifying a subgroup isomorphic to the modular group in the resulting factor group, a presentation of the group of representing matrices is obtained. The kernel of the symplectic representation on the plat subgroup is identified as the normal closure of a certain finite set of elements.
Dissert. Abstr.

N79-16605 Houston Univ., Tex.
MULTIFUNCTION FIXED-POINT THEORY AND ITS APPLICATION TO AN INITIAL-VALUE PROBLEM Ph.D. Thesis
Ron L. Schmidt 1978 96 p
Avail: Univ. Microfilms Order No. 7901193

The existence of a solution to the initial-value problem x(t) epsilon F(t,x(t)) x(0) = X sub 0 is shown. The function x is once-differentiable on a closed interval of real numbers having left endpoint zero into a Banach space. The multifunction F maps the cross product of the interval with the Banach space into the Banach space and x sub 0 is in the Banach space. The initial-value problem is transposed, using the Bochner integral, into a multifunction fixed point problem in the space of continuous functions on the interval into the Banach space. Several malfunction fixed point theorems are obtained in solving the transposed problem. Each of these results is dependent, either directly or indirectly, on the multifunction being condensing with respect to a measure of non-compactness. As a result, both the concept of a measure of non-compactness and the concept of a condensing multifunction are treated. Dissert. Abstr.

N79-16606 Georgia Univ., Athens.
A SURVEY OF COMPACTIFICATION Ph.D. Thesis
Walter Edward J. Bolton 1978 112 p
Avail: Univ. Microfilms Order No. 7901619

The development of the study of compactification is traced from these early beginnings to the present. Wallman constructed a compactification of a normal space X by embedding X as a dense subset in the space of ultrafilters in the lattice of closed subsets of X. Later, Frink showed that it was not necessary to take the lattice of closed subsets satisfying certain conditions, which Frink used to define a normal base. Frink asked if every compactification of a space could be realized as the space of ultrafilters of some normal base. A number of results related to Frink's question are summarized. The compactification of rim-compact spaces and Freudenthal's compactification dealt with metrizable spaces satisfying several conditions.
Dissert. Abstr.

N79-16607 California Univ., Los Angeles.
NEW RESULTS ON THE MOEBIUS FUNCTION AND APPLICATIONS OF A DUALITY PRINCIPLE Ph.D. Thesis
Krishnaswami Alladi 1978 165 p
Avail: Univ. Microfilms Order No. 7901328

Arithmetical functions connecting the largest prime factor of a number, the smallest prime factor, and the Moebius function were studied. These identities and the principles behind them have applications to the Theory of Primes. Some recent results which give novel interpretations to certain problems considered to be very classical are reported. Dissert. Abstr.

N79-16608 Nebraska Univ. - Lincoln.
RINGS OF BOUNDED MODULE TYPE Ph.D. Thesis
Bette Gene Midgarden 1978 38 p
Avail: Univ. Microfilms Order No. 7900336

Let R be a commutative ring with identity. It is stipulated that R has bounded module type if, for some positive integer n, it satisfies the following condition: (B sub n). Every finitely generated R-module is a direct sum of submodules generated by at most n elements. It is shown that every ideal of any commutative ring of bounded module type has only finitely many minimal prime ideals. Such a ring is a finite direct sum of rings of bounded module type, each of which has a unique minimal prime ideal. The proof is high topological, and depends on a detailed analysis of the space of prime ideals of R and the Stone-Cech compactification of the integers. Dissert. Abstr.

N79-16609 City Univ. of New York.
EQUATIONS FOR BENDING OF ELLIPSOIDS AND SPHERES Ph.D. Thesis
Michael Wade Ecker 1978 48 p
Avail: Univ. Microfilms Order No. 7900778

The nonlinear bending theory is considered for the thin-shelled ellipsoid of revolution, whose middle surface is described by $sq(x/a)+sq(y/a)+sq(z/b)=1$. Basic problems discussed in the development of the ellipsoid which are analogous to the Foeppl-Von Karman equations for the plate include the elimination of the other two deflection variables, u and v, (of the (u,v,w) triad) to obtain the compatibility equation; and, the representation of the stresses in terms of one stress function. While the general results for the ellipsoid are much messier than those for the sphere, the linear parts are both amenable to computer work for solutions, and for further comparison with the elasticity literature already in existance. Dissert. Abstr.

N79-16610 California Univ., San Diego.
MEASURES OF DEPENDENCE ON STATIONARY SEQUENCES OF RANDOM VARIABLES Ph.D. Thesis
Richard Crane Bradley, Jr. 1978 259 p
Avail: Univ. Microfilms Order No. 7901041

Conditions of weak dependence, or mixing conditions, on strictly stationary sequences of random variables are considered. The strong mixing condition, the uniform mixing condition, the maximal-correlation mixing condition, and the weak Bernoulli, for finite-state sequences are examined. It is already known that of these four conditions, uniform mixing implies the other three, and strong mixing follows from each of the other three. It is shown that for two-state sequences the other two conditions are incomparable in that neither implies the other. Theorems on the rates at which the mixing coefficients associated with the strong, uniform, or maximal-correlation mixing conditions can approach zero are proved. Dissert. Abstr.

N79-16611 Case Western Reserve Univ., Cleveland, Ohio.
THE ASYMPTOTIC BEHAVIOR OF SOME CLASSES OF ANALYTIC FUNCTIONS Ph.D. Thesis
Curtis Field Jefferson 1978 38 p
Avail: Univ. Microfilms Order No. 7901520

The boundary behavior of two classes of functions with asymptotic values on thin sets of measure zero on (z) = 1 is considered. One of these classes contains a subclass with asymptotic values on a dense but uncountable set of measure zero on (z) = 1. This subclass contains an infinite set of solutions to the Bloch-Nevanlinna conjecture which asserts that if f(z) is in the Nevanlinna class, then f'(z) is also in the Nevanlinna class. The class N infinity of normal analytic functions f(z) that possesses only the angular limit infinity on a dense set of measure zero on K: (z) = 1 is defined. The results may be extended to the class of functions N which are analytic in D and have only asymptotic value infinity on a dense set of measure zero on K. Examples are given to show that classes N infinity and N are nontrivial. Dissert. Abstr.

N79-16612# Instituto de Pesquisas, Sao Jose dos campos (Brazil).
ESTIMATION OF MATRICES ACCORDING TO CERTAIN OBJECTIVE FUNCTIONS [ESTIMATIVA DE MATRIZES SEGUNDO CERTAS FUNCOES OBJETIVO]
Marcos Jose de Aquino Pinto Pacca and Joanilio Roaolpho Teixeira Jul. 1977 37 p refs In PORTUGUESE Presented at Brasileira de Pesquisa Operacional - SOBRAPO, Rio de Janeiro, 21 - 23 Sep. 1977
(INPE-1086-PE/071) Avail: NTIS HC A03/MF A01

The problem of estimating a matrices with non-negative A for dividing a matrices associated with non-negative B was studied. Restrictions of certain types of elements for A are introduced. Objective functions as rectilinear, quadratic Euclidian, and Chebyshev norms are used. The solution methods are discussed and compared to those previously reported. Applications of this solution are presented. Transl. by F.O.S.

N79-16613*# Miami Univ., Coral Gables, Fla. Dept. of Electrical Engineering.
DEVELOPMENT OF BOOLEAN CALCULUS AND ITS APPLICATION Semi-annual Status Report, 16 Aug. 1978 - 15 Feb. 1979
Moiez A. Tapia 15 Feb. 1979 78 p refs
(Grant NsG-1436)
(NASA-CR-158088; SASR-3) Avail: NTIS HC A05/MF A01 CSCL 12A

Formal procedures for synthesis of asynchronous sequential system using commercially available edge-sensitive flip-flops are developed. Boolean differential is defined. The exact number of compatible integrals of a Boolean differential were calculated. S.E.S.

N79-16614# Stanford Univ., Calif. Dept. of Statistics.
NONNEGATIVE DEFINITENESS OF THE ESTIMATED DISPERSION MATRIX IN A MULTIVARIATE LINEAR MODEL
Friedrich Pukelsheim and George P. H. Styan May 1978 13 p refs
(Contract N00014-75-C-0442; Grant NSF MPS-75-09450)
(AD-A060864; SU-TR-32; SU-TR-125) Avail: NTIS HC A02/MF A01 CSCL 12/1

Estimation is considered in model where both the mean vector and the dispersion matrix have linear decompositions. It is shown that after an invariance reduction with respect to mean translation, MINQUE provides a nonnegative definite estimate of the dispersion matrix, when the decomposing matrices span a quadratic subspace of symmetric matrices. With normality, MINQUE is seen to equal the restricted maximum likelihood estimate and to be of uniformly minimum variance. Author (GRA)

N79-16615# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
SOLUTION OF ELECTROMAGNETIC BOUNDARY VALUE PROBLEMS OF COMPLICATED STRUCTURES. THEORY OF THE INTEGRAL EQUATION METHOD
Volker Stein 26 Jan. 1978 93 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-78-01) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 30,40

The theory for the determination of the radiation and scattering behavior of complicated structures with the aid of the integral equation method was studied. These structures may be complicated isolated radiators or shapes like helicopters or satellites, which are excited by an electromagnetic wave. The objective of the integral equation method is the determination of the surface currents, from which all electromagnetic parameters may be computed. For this reason two independent integral equations for the electric and magnetic field are derived from the vector wave equations by means of the second Greens theorem. The field of application of these two equations is discussed in detail. F.O.S.

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-16616 Indiana Univ., Bloomington.
TWO PROBLEMS OF PROBABILITY AND FUNCTIONAL ANALYSIS Ph.D. Thesis
Deborah Faye Allinger 1978 111 p
Avail: Univ. Microfilms Order No. 7900373

The results obtained in studying two problems which are characterizing the ideals of (p,q,r)-absolutely summing operators on Hilbert space, and constructing abstract Wiener spaces from tensor products of separable Banach spaces are presented. Dissert. Abstr.

N79-16617 Montana State Univ., Missoula.
EFFICIENCY EVALUATION FOR THE NESTED CUBE RESPONSE SURFACE DESIGN Ph.D. Thesis
Melvin Carl Linnell 1978 96 p
Avail: Univ. Microfilms Order No. 7823185

The nested cube response surface design is defined and its attributes described. Variance, bias and potential estimators are evaluated for the nested cube design. The standard least-squares estimator is examined for the quadratic and cubic models. Estimable parameters in the cubic model are derived for the nested cube design as well as a set of select designs. A minimum bias estimator is examined where the true model is cubic and the fitted model is quadratic. The nested cube design was the only design of the set examined for which the estimator existed. Two measures of bias efficiency are introduced and used to compare the nested cube design to a set of selected designs. Variance efficiency is evaluated in terms of A-, V-, and D-efficiencies. A calculation formula for the determinant of the sum of squares matrix is derived for symmetric designs with zero odd moments. Profiles of the variance are shown on selected vectors in the region of interest. Dissert. Abstr.

N79-16618 Cornell Univ., Ithaca, N. Y.
CONTRIBUTIONS TO THE THEORY OF F-SQUARES AND F-CUBE DESIGNS Ph.D. Thesis
John Peter Mandeli 1978 172 p
Avail: Univ. Microfilms Order No. 7902345

The concept of F-squares involves the condition that every element or treatment appears once in each row, and each column is replaced by the condition that it appears an equal number of times in each row and each column but not necessarily once. Just as the concepts of Latin squares and sets of orthogonal Latin squares can be generalized to the concepts of Latin cubes and sets of orthogonal Latin cubes, so can the concepts of F-squares and sets of orthogonal F-squares be generalized to the concepts of F-cubes and sets of orthogonal F-cubes. Topics covered include using complete sets of orthogonal F-squares to construct balanced block designs; F-Youden designs and sets of orthogonal F-Youden designs; miscellaneous results about orthogonal F-squares; and decomposing any Latin square into orthogonal F-squares. Dissert. Abstr.

N79-16619 Cornell Univ., Ithaca, N. Y.
TWO PROBLEMS IN OPTIMAL DESIGN THEORY Ph.D. Thesis
William Irwin Notz 1978 100 p
Avail: Univ. Microfilms Order No. 7902355

A problem of model robustness for multivariate linear regression is studied. The regression model is of the form of multivariate linear regression in k variables plus an unknown contamination. The contamination is assumed to be from a class of real-valued functions whose absolute value is bounded by a fixed constant. Squared error loss is assumed and a linear estimator and design of finite support are sought which minimize the maximum, over all possible contaminations, of the loss. The solution is found to be the usual best linear unbiased estimators and the usual optimal design with uniform weights on the corners of the region in question. Some difficulties associated with the model are discussed. The problem of finding D-optimal minimal point designs for k-variate polynomial regression on the k-dimensional cube with sides of length 2 and center of the origin is examined. Dissert. Abstr.

N79-16620 Indiana Univ., Bloomington.
BAYESIAN NONPARAMETRIC INFERENCE FOR QUANTILES Ph.D. Thesis
Damon Philip Disch 1978 123 p
Avail: Univ. Microfilms Order No. 7900388

The mixture of Dirichlets is used as a priori in order to find a posteriori distribution of a quantile. In order to find such posteriori, a general theorem is proven which leads from a distribution on the probabilities of the intervals in the partition of IR to an approximation of the distribution on the quantile. An analysis of some weight data is given illustrating the distribution of a quantile and Bayesian confidence intervals for that quantile. Another application of the theorem is given concerning finding a distribution for a quantile in the bio-assay problem. A corollary of the general theorem is used to find the joint distribution of two quantiles in the case of either a Dirichlet process prior or a mixture of Dirichlets. A further analysis is made of the weight data, and illustrations are given of how such a joint distribution can help determine the spread of the sampling distribution. Dissert. Abstr.

N79-16621 Georgia Univ., Athens.
THE DISTRIBUTION OF THE STANDARD DEVIATION AND STUDENT'S t FROM NON-NORMAL UNIVERSES Ph.D. Thesis
Hing-Kam Ceva Lam 1978 242 p
Avail: Univ. Microfilms Order No. 7901659

The distributions of m sub 2 and m prime sub 2 (sample second central and noncentral moment) in exponential sampling for n less than or equal to 4 are derived. Moments of m sub 2 for any sample size are also derived under the same assumption about the parent population. A system of frequency curves is generalized from the distributions of m sub 2 and m prime sub 2. Members of the generalized system are then fitted by the method of moments to the distributions of m sub 2 for n greater than or equal to 5. Approximants using the Pearson system are also studied. A series representation of the distribution function of the Student t under nonnormality is derived. Contours of the modified probability levels at both tails for various sample sizes are also constructed. Dissert. Abstr.

N79-16622 Georgia Univ., Athens.
ON THE ESTIMATION OF THE PROBABILITY OF SUCCESS FOR TEST DESIGN VARIABLE OF MIXED TYPE Ph.D. Thesis
Chong-Sun Hwang 1978 181 p
Avail: Univ. Microfilms Order No. 7901648

Three methods, called the Direct Nonlinear Least-Squares (DNLS) method, the Maximum Likelihood method with binomial approach (BMLE), and the Maximum Likelihood method under the normal assumption (DMLE), are presented. One-sample and two-sample tests for logistic distribution by the Kolmogorov-Smirnov type statistic were developed. Multivariate mixed type variables (continuous, ranking and categorical) are considered by applying a generalized classification statistic (Kossack) and linking this statistic with the single variable logistic model. A study was made to compare the Kossack method of fitting a single logistic model to a set of data involving a categorical type variable to the method of pooling the data and using the same model for each category. Dissert. Abstr.

N79-16623 Georgia Univ., Athens.
EVALUATION OF BIVARIATE DISTRIBUTION FUNCTIONS USING THE BIVARIATE PEARSON FAMILY Ph.D. Thesis
Rudolph Sanders Parrish 1978 144 p
Avail: Univ. Microfilms Order No. 7901676

A method is presented for approximating cumulative probabilities for bivariate distributions of which mixed moments are known. The approach is based upon a marginal-conditional factorization of the joint probability density function of a bivariate Pearson distribution which is then utilized in a non-standard Gaussian quadrature technique to evaluate the cumulative distribution function. Methods for approximating moments of the conditional distribution and for obtaining truncated moments of the marginal distribution are developed. Illustrations include some distributions which are Pearson members, where exact results are obtained, non-Pearson members, and a discrete case. A computer routine incorporating the marginal-conditional approach is included. Dissert. Abstr.

N79-16624 Cornell Univ., Ithaca, N. Y.
STUDIES ON THE ESTIMATION OF VARIANCE COMPONENTS Ph.D. Thesis
Robert Donald Anderson 1978 146 p
Avail: Univ. Microfilms Order No. 7902307

A unified approach for deriving methods for estimating variance components in a mixed (or random) linear model is presented. Vec and Kronecker product operators are used in constructing derived linear models in which the vector of means is the vector of variance components to be estimated. Variance component estimators are derived by applying well-known linear estimation techniques to the derived models. The column spaces of the design matrices in the derived models are shown to be invariant under respective variance-covariance matrices. The application of particular methods for estimating variance components in animal breeding analyses is discussed. Dissert. Abstr.

N79-16625 Florida Univ., Gainesville.
BAYESIAN MODELING OF NONSTATIONARITY IN NORMAL AND LOGNORMAL PROCESSES WITH APPLICATIONS IN CVP ANALYSIS AND LIFE TESTING MODELS Ph.D. Thesis
Jorge Ivan Velez-Arocho 1978 229 p
Avail: Univ. Microfilms Order No. 7900100

Probability models applied by decision makers in a wide variety of contents must be able to provide inferences under conditions of change. A stochastic process whose probabilistic properties change through time can be described as a noastationary process. A model involving normal and lognormal processes is developed for handling a particular form of nonstationarity within a Bayesian framework. Practical implications of the results for the areas of Cost-Volume-Profit Analysis and life testing are discussed with emphasis on the predictive distribution for the outcome of a future observation from the data generation process. It is emphasized that a Cost-Volume-Profit (CVP) and life testing model ideally should include the changing character of the process by allowing for changes in the parametric description of the process through time. Failure to recognize nonstationarity when it is present has a number of implications in the CVP and life-testing contexts that are explored. Dissert. Abstr.

N79-16626 Texas A&M Univ., College Station.
THE ESTIMATION OF NON-SAMPLING VARIANCE COMPONENTS IN SAMPLE SURVEYS Ph.D. Thesis
Paul Philip Biemer 1978 94 p
Avail: Univ. Microfilms Order No. 7900952

A general procedure for estimating the variance of target parameter estimates directly from the reported content items of standard multistage surveys was developed. This dissertation extends the procedure to include general multistage survey designs with nonnegligible sampling fractions and either equal or unequal probability sampling in each stage. For several forms of the general survey model, interviewer and coder allocation criteria which guarantee the estimability of the nonsampling variance

components are derived. Methods for estimating the total variance of population target parameter estimates which comply with standard survey sampling designs and interviewer and coder allocation patterns are developed. Dissert. Abstr.

N79-16627 Southern Methodist Univ., Dallas, Tex.
MINIMUM DISTANCE AND ROBUST ESTIMATION Ph.D. Thesis
William Chris Parr 1978 124 p
Avail: Univ. Microfilms Order No. 7901708

The minimum distance (D) estimation method is shown to provide a heuristically reasonable mode of attack for parameter estimation problems which also leads to some excellent robustness properties. Projective and other aspects of D-estimation are investigated and provide instructive connections with M, R, and A estimation. Previous attempts at the general parameter estimation problem are examined and contrasted with the extension of the D-estimation method. A new definition of Robust-Asymptotically Normal at Gamma Sequences of estimators is given and related to previous definitions of robustness.
Dissert. Abstr.

N79-16628 Pennsylvania Univ., Philadelphia.
THE PARTIAL LEAST SQUARES APPROACH TO PATH MODELS OF INDIRECTLY OBSERVED VARIABLES WITH MULTIPLE INDICATORS Ph.D. Thesis
Baldwin Siu-Sing Hui 1978 199 p
Avail: Univ. Microfilms Order No. 7824731

A new data-oriented approach, called Partial Least Squares (PLS) soft-modeling is presented. There are no distributional assumptions on the variables; ordinary least squares is applied iteratively on the structural equations, allowing direct casual/predictive interpretations in these equations. The PLS approach is primarily intended for complex situations in multidisciplinary studies with little prior information on the distributional properties and the interrelationships among the variables. When the latent variables in the model form a casual chain (recursive system), the specification and estimation of the PLS model is based on two principles to which the least squares criterion is applied. PLS Models include as special cases the principal component and canonical correlation models. A strategy for building a big PLS interdependent model with latent variables and multiple indicators is introduced. Generalization aspects and directions for future research is disucssed. Dissert. Abstr.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-16629 Cornell Univ., Ithaca, N. Y.
PROPERTIES AND EFFICIENT ALGORITHMS FOR CERTAIN CLASSES OF SEQUENCING PROBLEMS Ph.D. Thesis
Clyde Lawrence Monma 1978 167 p
Avail: Univ. Microfilms Order No. 7902283

An introduction to the history of sequencing and scheduling theory is presented along with a more detailed discussion of the results presented. The basic definitions and notation are developed and summarized. A number of widely studied problems are presented as examples to which the results apply. These include the one-machine total weighted completion. An efficient general algorithm is presented for the class of problems studied with series-parallel precedence constraints. The general precedence constrained version of these sequencing problems is studied. Transformations are developed which reduce the size of a problem while preserving an optimal permutation. The method of adjacent pairwise job interchange is generalized to pairwise (not necessarily adjacent) job interchanges and the insertion of a job into another position in a sequence. The application of these results to sequencing problems with secondary cost functions is considered. Dissert. Abstr.

N79-16630 California Univ., Santa Cruz.
THE USE AND VALUE OF MODELS IN DECISION ANALYSIS Ph.D. Thesis
Robert Cole Nickerson 1978 203 p
Avail: Univ. Microfilms Order No. 7900828

Decision analysis is a discipline which is concerned with the theory and methodology of decision making. An important part of the methodology is the use of an explicit model to characterize the various aspects of the decision problem. A new conceptual framework for the use of models is developed. The model is used to provide information to the decision maker. Alternative roles for models in the context of decision analysis are explored. The expected value of modeling as the increase in the expected value of the outcome that results from the use of the model-supplied information is defined. The value of modeling by proving that under certain conditions the value is zero, increasing, decreasing, and maximized is characterized. The most useful result is that, under certain conditions, the expected value of modeling is maximum when the means of the prior probability distributions of the outcomes for each alternative are equal.
Dissert. Abstr.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N79-16631 North Carolina Univ. at Chapel Hill.
TOPOLOGICAL EQUIVALENCE OF GRADIENT VECTOR FIELDS Ph.D. Thesis
Douglas Stuart Shafer 1978 80 p
Avail: Univ. Microfilms Order No. 7900503

The behavior of the topological equivalance class of the planar vectorfied X = gradient sub g V, in a neighborhood of a degenerate singularity of V, as g varies over all Riemannian metrics is studied. It is shown that under simple restrictions on V the topological equivalance class of X is determined by its first non-vanishing jet, and that only finitely many equivalence classes occur (for fixed V). In this case, when the degree of the first non-vanishing jet of V is less than or equal to four, necessary and sufficient conditions are given for change in topological type, both in terms of the coefficients of the homogeneous part of V and geometrically in terms of its level curves. A catalogue of possible phase portraits, up to topological equivalence, is included. Necessary conditions are given for change in higher degree. The situation in higher dimensions is also discussed. Dissert. Abstr.

N79-16632 Bowling Green State Univ., Ohio.
LATTICE-ORDERED GROUPS OF ORDER AUTOMORPHISMS OF PARTIALLY ORDERED SETS Ph.D. Thesis
Maureen Ann Bardwell 1978 130 p
Avail: Univ. Microfilms Order No. 7901425

An interesting property of the lattice-ordered group of order automorphisms of a chain is that positive elements of the group are algebraically disjoint if and only if they have disjoint supports. The partially ordered sets are classified whose groups of order automorphisms are lattice-ordered groups which enjoy a disjoint support property. Explicitly described are those lattice-ordered groups which arise as the full group of automorphisms of such a partially ordered set. Dissert. Abstr.

N79-16633 Kansas Univ., Lawrence.
RICH PROXIMITIES ON TYCHONOFF SPACES Ph.D. Thesis
Stephan Carl Carlson 1978 89 p
Avail: Univ. Microfilms Order No. 7824780

The realcompactifications of a Tychonoff space are obtainable as uniform completions of its compatible uniformities, and its compactifications are obtainable as Smirnov compactifications of its compatible proximities. Uniformities and proximities are used to investigate realcompactifications of a Tychonoff space contained in a given compactification, and the notions involved are generalized to study E-compactifications of E-completely regular spaces for certain Tychonoff spaces E. Dissert. Abstr.

N79-16634 Oklahoma Univ., Norman.
HEIGHT ONE SEPARABLE ALGEBRAS OVER COMMUTATIVE RINGS Ph.D. Thesis
Lawrence Wayne Naylor 1978 83 p
Avail: Univ. Microfilms Order No. 7824608

An R-algebra S is said to be height 1 separable over R if S

sub p is a separable R sub p-algebra for each height 1 prime ideal P in R. Some general properties for height separable algebras are established, similar to some of the basic properties of separable algebras. If R and S are domains, then in some cases the minimal primes in S are unramified if S is height 1 separable over R. A result of Auslander and Buchsbaum states that if R is an integrally closed Noetherian domain and S is the integral closure of R in a separable field extension of the quotient field of R, with S R-projective, then S is R-separable if and only if each minimal prime ideal of S is unramified. The examples here show that this result can fail to hold if some of these hypotheses are removed. Dissert. Abstr.

N79-16635 California Univ., Los Angeles.
ON ABSTRACT RECURSION THEORY AND RECURSION IN THE UNIVERSE OF SETS Ph.D. Thesis
Lefteris Miltiades Kirousis 1978 68 p
Avail: Univ. Microfilms Order No. 7901370

Topics of abstract recursion theory are studied in the context of monotone induction algebras. Conditions that can add or change functionals of a second order structure without changing its envelope are given to show that if for an acceptable structure the Kleene type of two object E that embodies existential quantification is recursive, then the envelope and the companion class of the structure are independent of the choice of a definable coding scheme. A coding free proof is given of the fact that if a functional in the algebra generated by E# has closure ordinal less than the closure ordinal corresponding to recursion in the object E, then it defines a boldface semirecursive in E relation. It is shown that the hierarchy defined for the hyperelementary sets of a structure can be extended to structures that are not necessarily acceptable and are endowed with a monotone, nontrivial quantifier. A model theoretic characterization for the class of hyperelementary sets of an acceptable structure endowed with a quantifier is obtained. Recursion in the universe of sets is also studied. Dissert. Abstr.

N79-16636# Rochester Univ., N. Y. College of Engineering and Applied Science.
MATHEMATICAL FOUNDATIONS OF CONSTRUCTIVE SOLID GEOMETRY: GENERAL TOPOLOGY OF CLOSED REGULAR SETS
Aristides A. G. Requicha and Roberti B. Tilove Mar. 1978 35 p refs
(Grants NSF APR-76-01034; NSF GI-34274X)
(PB-286596/2; TM-27; NSF/RA-780069) Avail: NTIS HC A03/MF A01 CSCL 12A

Constructive solid geometry is a scheme for modeling rigid solid objects as set-theoretical compositions of primitive solid building blocks. Constructive solid geometry is based largely on modern Euclidean geometry and general (i.e., point-set) topology of subsets of E3 (Euclidean three-dimensional space). Certain elementary but specialized results of point-set topology useful in the study of geometric modeling are discussed. Proofs of results not available in the cited references are included. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-16637 Utah State Univ., Logan.
A NEW TECHNIQUE FOR THE INVESTIGATION AND MODELING OF COMPLEX NON-EQUILIBRIUM KINETICS SYSTEMS Ph.D. Thesis
John Paul Kennealy 1978 232 p
Avail: Univ. Microfilms Order No. 7821140

An alternative approach to the integration and modeling of large, stiff kinetics systems is presented. By treating stiffness as a predictable consequence of the numerical treatment applied to physical problems with known mathematical structure, the Taylor series was augmented to produce an integration algorithm which is comparable in both accuracy and efficiency to the best existing methods. Stiffness is coped with by a transformation which capitalizes on the largeness of irrelevant eigenvalues; yet, the algorithm is basically scalar and no matrix methods or eigenvalue determinations are required. The use of KINETX for the modeling of atmospheric infrared radiation from nitric oxide is discussed, and the application of new chemi-excitation data to the analysis of auroral excitation measurements is illustrated. Dissert. Abstr.

N79-16638 California Univ., Los Angeles.
DYNAMICAL SYMMETRY BREAKDOWN AT THE TWO-DRESSED-LOOP LEVEL AND BEYOND Ph.D. Thesis
Ronald Cintra Shellard 1978 99 p
Avail: Univ. Microfilms Order No. 7901401

It is first shown that, because the loop expansion of the effective action (sum of connected vacuum graphs) deals with dressed lines and vertices (skeletons with no self-energy insertions), it is possible to order the expansion in powers of the renormalized coupling constant, even though inverse powers of g appear (signaling nonperturbative effects in the symmetry-breaking sector). It is then shown that, for certain Abelian and non-Abelian gauge theories, CP violation does not occur at the level of two dressed loops in the effective action. All masses and coupling constants appearing in the Ginzburg Landau Langrangian in terms of the coupling constants and masses of the symmetric theory appear again at the two-loop level. A mass hierarchy appears, much like that of Coleman-Weinberg, in which the scalar mass is O(g) times the vector mass. Dissert. Abstr.

N79-16639*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CALCULATION OF LONG RANGE FORCES AND THEIR APPLICATIONS IN DETERMINING GASEOUS PROPERTIES
Jag J. Singh Jan. 1979 31 p refs
(NASA-TM-78817) Avail: NTIS HC A03/MF A01 CSCL 07E

A discussion of various theoretical and experimental techniques for the calculation of long range interaction between two atomic systems at moderate separation is presented. Some applications of these techniques for obtaining gaseous properties are described. The forces between neutral molecules and metallic surfaces are also discussed and numerical values of heats of adsorption for a number of systems are calculated. G.Y.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-16640 Kansas Univ., Lawrence.
GENERAL AVIATION INTERIOR NOISE STUDY Ph.D. Thesis
Tonnis Dick Peschier 1978 154 p
Avail: Univ. Microfilms Order No. 7824861

The organization of and work completed for an ongoing general aviation interior noise research project focusing on the transmission of sound through aircraft type panels is presented. Described are typical noise source, sound transmission path and acoustic cabin properties and their effect on interior noise. Based on both annoyance and physiological damage criteria, it is concluded that typical in-cabin noise levels of around 90 db(A) or greater are undesirably high. Some theoretical and empirical methods are discussed that are intended for prediction and analysis of the transmission of sound through panels. Included is a description of the construction, calibration and properties of an acoustic panel test facility. Some preliminary experimental results obtained in this facility are presented. Dissert. Abstr.

N79-16641*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLUCTUATING LOADS MEASURED ON AN OVER-THE-WING SUPERSONIC JET MODEL
Conrad M. Willis Jan. 1979 41 p refs
(NASA-TP-1366; L-12511) Avail: NTIS HC A03/MF A01 CSCL 20A

Fluctuating pressure loads on the wing and flap of an over-the-wing supersonic jet model were measured. The model

was tested statically and at a Mach number of 0.1 in a small free jet to simulate forward speed. Test parameters were impingement angle, nozzle height, and flap deflection. Load levels as high as 170 db were measured at the center of the impingement region during static tests. Forward speed reduced the loading about 1 db. Load level increased with increasing impingement angle and decreasing nozzle height above the wing. The effect of flap deflection was small. When scaled to full-size aircraft conditions, the maximum amplitude of the one-third-octave fluctuating pressure spectra was about 154 db at about 160 Hz. Maximum load level occurred near the intersection of the nozzle center line with the impinged surface. Downstream of the maximum the fluctuating pressure is inversely proportional to the distance downstream of the nozzle. A.R.H.

N79-16642*# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

ACOUSTIC SCATTERING BY CIRCULAR CYLINDERS OF VARIOUS ASPECT RATIOS Final Report

Algirdas Maciulaitis Jan. 1979 54 p

(Contract NAS1-14766)

(NASA-CR-3068) Avail: NTIS HC A04/MF A01 CSCL 20A

The effects of acoustic scattering on the useful frequency range of pressure gradient microphones were investigated experimentally between ka values of 0.407 and 4.232 using two circular cylindrical models (L/D = 0.5 and 0.25) having a 25 cm outside diameter. Small condenser microphones, attached to preamplifiers by flexible connectors, were installed from inside the cylindrical bodies, and flush mounted on the exterior surface of the cylinders. A 38 cm diameter woofer in a large speaker enclosure was used as the sound source. Surface pressure augmentation and phase differences were computed from measured data for various sound wave incidence angles. Results are graphically compared with theoretical predictions supplied by NASA for ka = 0.407, 2.288, and 4.232. All other results are tabulated in the appendices. With minor exceptions, the experimentally determined pressure augmentations agreed within 0.75 dB with theoretical predictions. The agreement for relative phase angles was within 5 percent without any exceptions. Scattering parameter variations with ka and L/D ratio, as computed from experimental data, are also presented. A.R.H.

N79-16643*# Universities Space Research Association, Hampton, Va. Inst. for Computer Applications in Science and Engineering.

COMPUTATION OF ACOUSTIC WAVES IN A JET

Alvin Bayliss and E. Turkel (New York Univ.) 22 Dec. 1978 34 p refs

(Contract NAS1-14101; Grant AF-AFOSR-2881-76)

(NASA-CR-157645; Rept-78-22) Avail: NTIS HC A03/MF A01 CSCL 20A

A numerical treatment of acoustic waves in a jet is described. The full time dependent Euler equations are used in both linear and nonlinear formulations. The computational region of integration is artificially bounded and boundary conditions are developed to simulate outgoing waves and to enable the computational domain to be substantially restricted. Higher order methods and coordinate transformations are introduced to further reduce the number of grid points as well as to increase the efficiency of the program. Numerical results are presented for time harmonic sources as well as for sources with more complicated time dependence. Author

N79-16644*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THREE-DIMENSIONAL FINITE-ELEMENT ELASTIC ANALYSIS OF A THERMALLY CYCLED SINGLE-EDGE WEDGE GEOMETRY SPECIMEN

Peter T. Bizon, Richard J. Hill (AFAPL), Bruce P. Guilliams, Sandra K. Drake (AFAPL), and Jeffrey L. Kladden (AFAPL) Jan. 1979 53 p refs

(NASA-TM-79026; E-9861) Avail: NTIS HC A04/MF A01 CSCL 20A

An elastic stress analysis was performed on a wedge specimen (prismatic bar with single-wedge cross section) subjected to thermal cycles in fluidized beds. Seven different combinations consisting of three alloys (NASA TAZ-8A, 316 stainless steel, and A-286) and four thermal cycling conditions were analyzed. The analyses were performed as a joint effort of two laboratories using different models and computer programs (NASTRAN and ISO3DQ). Stress, strain, and temperature results are presented. Author

N79-16645*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FULL-SCALE ENGINE TESTS OF BULK ABSORBER ACOUSTIC INLET TREATMENT

L. J. Heidelberg and L. Homyak 1979 16 p refs Presented at the 5th Aeroacoustics Conf., Seattle, 12-14 Mar. 1979; sponsored by AIAA

(NASA-TM-79079; E-9899) Avail: NTIS HC A02/MF A01 CSCL 20A

Three different densities of Keviar bulk absorber fan inlet treatment were tested on a YF 102 turbofan engine. This bulk absorber material may have potential for flight application. Farfield noise measurements were made and the attenuation properties of the three treatment densities were compared. In addition, the best bulk treatment was compared to the best single degree of freedom, SDOF (honeycomb and perforated cover sheet) treatment from another investigation. Although the density was varied over a large range, (3 to 1) the effect on attenuation was small. The highest density treatment, 11.8 lb/cubic ft., had a somewhat broader attenuation bandwidth. The comparison of the best bulk and SDOF treatments showed the bulk to have a much greater attenuation bandwidth. At the design frequency both types of treatment had almost equal performance. Author

N79-16646*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MODAL PROPAGATION ANGLES IN DUCTS WITH SOFT WALLS AND THEIR CONNECTION WITH SUPPRESSOR PERFORMANCE

Edward J. Rice 1979 16 p refs Presented at the 5th Aeroacoustics Conf., Seattle, 12-14 Mar. 1979; sponsored by AIAA

(NASA-TM-79081; E-9902) Avail: NTIS HC A02/MF A01 CSCL 20A

The angles of propagation of the wave fronts associated with duct modes are derived for a cylindrical duct with soft walls (acoustic suppressors) and a uniform steady flow. The angle of propagation with respect to the radial coordinate (angle of incidence on the wall) is shown to be a better correlating parameter for the optimum wall impedance of spinning modes than the previously used mode cutoff ratio. Both the angle of incidence upon the duct wall and the propagation angle with respect to the duct axis are required to describe the attenuation of a propagating mode. Using the modal propagation angles, a geometric acoustics approach to suppressor acoustic performance was developed. Results from this approximate method were compared to exact modal propagation calculations to check the accuracy of the approximate method. The results are favorable except in the immediate vicinity of the modal optimum impedance where the approximate method yields about one-half of the exact maximum attenuation. Author

N79-16647*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF INFLOW DISTORTION PROFILES ON FAN TONE NOISE CALCULATED USING A 3-D THEORY

Hiroshi Kobayashi and John F. Groeneweg 1979 18 p refs Presented at the 5th Aeroacoustics Conf., Seattle, Wash., 12-14 Mar. 1979; sponsored by AIAA

(NASA-TM-79082; E-9904) Avail: NTIS HC A02/MF A01 CSCL 20A

Calculations of the fan tone acoustic power and modal structure generated by complex distortions in axial inflow velocity are presented. The model used treats the motor as a rotating three-dimensional cascade and calculates the acoustic field from the distortion-produced dipole distribution on the blades including noncompact source effects. Radial and circumferential distortion shapes are synthesized from Fourier-Bessel components representing individual distortion modes. The relation between individual distortion modes and the generated acoustic modes is examined for particular distortion cases. Comparisons between theoretical and experimental results for distortions produced by wakes from

upstream radial rods show that the analysis is a good predictor of acoustic power dependence on disturbance strength. Author

N79-16648*# Lockheed-Georgia Co., Marietta.
BLOWN FLAP NOISE PREDICTION Final Report, Sep. 1977 - 1978
N. N. Reddy Sep. 1978 97 p refs
(Contract NAS1-15068)
(NASA-CR-158978; LG78ER0237) Avail: NTIS HC A05/MF A01 CSCL 20A

Theoretical and experimental developments of flow-surface interaction noise with a particular emphasis on blown-flap noise were reviewed. Several blown-flap noise prediction methods were evaluated by comparing predicted acoustic levels, directivity, and spectra with a recently obtained data base. A prediction method was selected and a detailed step-by-step description of this method was provided to develop a computer module to calculate one-third octave band frequency spectra at any given location in the far-field for under-the-wing and upper surface blown configurations as a function of geometric and operational parameters. G.G.

N79-16649*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEASUREMENTS OF ACOUSTIC SOURCES IN MOTION
L. Maestrello and T. D. Norum Dec. 1978 14 p refs To be presented at VKI/AGARD Special Course, Brussels, 28 May 1979 - 1 Jun. 1979
(NASA-TM-78819) Avail: NTIS HC A02/MF A01 CSCL 20A

Results of the far-field pressures measured from three different types of moving sources are presented. These acoustic sources consist of a point monopole, a small model jet, and an aircraft. Results for the pressure time history produced by the point source show good agreement with those predicted analytically. Both actual and simulated forward motion of the model jet show reductions in noise levels with forward speed at all angles between the source and observer. Measurement with the aircraft over both an anechoic floor and over the ground yields a method for evaluating the transfer function for ground reflections at various angles between the moving aircraft and measurement position. G.Y.

N79-16650*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PRELIMINARY CHARACTERIZATION OF A ONE-AXIS ACOUSTIC SYSTEM
W. A. Oran, D. A. Reiss, L. H. Berge, and H. W. Parker Jan. 1979 18 p refs
(NASA-TM-78213) Avail: NTIS HC A02/MF A01 CSCL 20A

The acoustic fields and levitation forces produced along the axis of a single-axis resonance system were measured. The system consisted of a St. Clair generator and a planar reflector. The levitation force was measured for bodies of various sizes and geometries (i.e., spheres, cylinders, and discs). The force was found to be roughly proportional to the volume of the body until the characteristic body radius reaches approximately 2/k (k = wave number). The acoustic pressures along the axis were modeled using Huygens principle and a method of imaging to approximate multiple reflections. The modeled pressures were found to be in reasonable agreement with those measured with a calibrated microphone. A.R.H.

N79-16651# Admiralty Underwater Weapons Establishment, Portland (England).
ACOUSTIC RADIATION AND SCATTERING FROM ELASTIC STRUCTURES
D. T. Wilton Apr. 1978 30 p refs
(AUWE-TN-574/78; BR64800) Avail: NTIS HC A03/MF A01

A numerical technique for the linear dynamic analysis of a finite elastic structure immersed in an infinite homogeneous acoustic medium is presented. It is required to determine the vibratory motion of the structure and also the associated acoustic field in the fluid, when the structure is either subjected to internal applied force or is acting as a scatterer of an incident acoustic wave. A finite element analysis of the structure is matched at the structure-fluid interface with an integral equation representation of the exterior acoustic field, leading to a coupled system of equations which may be cast in either acoustic or structural form. The former approach is preferred here for which results are presented when the method is applied to plane wave scattering by thick and thin elastic spherical shells. G.Y.

N79-16652# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
JET NOISE RADIATION FROM DISCRETE VORTICES
E. G. Broadbent London Aeron. Res. Council 1978 30 p refs Supersedes RAE-TR-76034; ARC-36785
(ARC-R/M-3826; BR64878; RAE-TR-76034; ARC-36785)
Avail: NTIS HC A03/MF A01; HMSO £ 3.50; PHI

The modes of vibration of simple two-dimensional discrete vortices are examined and some analysis given for the acoustic radiation from such modes after a disturbance. The dominant radiation is shown to be of quadrupole type with a frequency proportional to the mean vorticity, and in a jet mixing region this frequency is expected to fall linearly with increasing vortex radius. Some speculations are made about the practical effect of forward speed on jet noise. Author

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-16653 Nebraska Univ. - Lincoln.
ROTATIONAL COUPLING IN ION-ATOM COLLISIONS Ph.D. Thesis
Kennedy James Reed 1978 67 p
Avail: Univ. Microfilms Order No. 7900346

The effects of rotational coupling are examined in two low energy charge exchange collisions. A justification for a semiclassical treatment of the collisions is presented and it is then shown that for low incident velocity the impact parameter treatment reduces to the Perturbed Stationary State method. Thus the ion-atom system is treated as a quasi-molecule. During the collisions the internuclear axis rotates and this rotation is treated as a perturbation which couples certain states in the quasi-molecule. This approach is used to derive expressions for the scattering amplitudes of the Sigma, Pi and Delta states of the He(+) - He system. The molecular states for the He(+) + Xe system are determined and the scattering amplitudes for low energy proton-Xenon collisions are calculated. It is shown that a molecular model leads to the prediction of spin polarized hydrogen in accordance with the earlier work. Dissert. Abstr.

N79-16654 Iowa State Univ. of Science and Technology, Ames.
APPLICATIONS OF SOLID STATE NUCLEAR MAGNETIC RESONANCE TECHNIQUES TO THE STUDY OF COALS AND POLYMERS Ph.D. Thesis
Robert George Pembleton 1978 181 p
Avail: Univ. Microfilms Order No. 7900203

The techniques of solid state NMR are applied to a number of chemical systems. Specific applications are made to crystallinity in polymers, to combined sample spinning and multiple pulse techniques, and to aromatic and aliphatic content of vitrain portions of coals of varying carbon content. Dissert. Abstr.

N79-16655 Rensselaer Polytechnic Inst., Troy, N. Y.
A CONTRIBUTION TO THE STATISTICAL MECHANICS OF ONE-DIMENSIONAL SYSTEMS WITH INTERACTIONS Ph.D. Thesis
Eric Tsu-Yin Hsieh 1978 232 p
Avail: Univ. Microfilms Order No. 7900227

A square-well potential function is used to define the particle interactions. The canonical partition functions obtained from these approaches are compared with an exact formula for the partition function which is derived through direct integrations of the phase integral. Based upon the same set of potential energy parameters, the numerical values of the properties of the system are calculated and compared. Mathematical justifications for the physical assumptions of the inexact approaches are suggested based on the comparisons, and the possible improvements on these approaches are discussed. The mathematical aspects and the generalizability of the approach for the exact formulation of the canonical partition function are discussed. A rigorous

formulation of the partition function for the one-dimensional system with particle interactions beyond nearest neighbors is derived. Its link to a possible phase transition of such a one-dimensional system is also investigated. Dissert. Abstr.

N79-16656 Michigan State Univ., East Lansing.
PHOTOPHYSICS OF WEAKLY INTERACTING MOLECULAR SYSTEMS Ph.D. Thesis
Chenpin Chang 1978 152 p
Avail: Univ. Microfilms Order No. 7900679

The luminescence properties of two weakly interacting molecular systems: alpha-carboline hydrogen bonded dimer and its acetic acid complex and 1,3-diphenyl propane derivatives are discussed. For the alpha-carboline-acetic acid complex, a forward rate constant of 8.9 x 10 to the 8th power sec/1 was obtained and the energy barrier was estimated to be 0.18 Kcal/mole. Both alpha-carboline and acetic acids protons were replaced by deuterium. The biological relevance of double proton transfer in DNA base pairs is discussed briefly. In the second system, the heteroatom acts as an electron donor with respect to the benzene ring leading to charge transfer interaction. This charge transfer interaction manifests itself in the absorption spectra by intensity enhancement that is consistent with the ionization potential of the heteroatom. The fluorescence spectra of these compounds are solvent-dependent. In hydrocarbon solvents, one observes excimer emission corresponding to a sandwich-type conformation where the two benzene rings are parallel. Dissert. Abstr.

N79-16657 Cornell Univ., Ithaca, N. Y.
REACTIVE AND PHYSICAL DEACTIVATION OF ELECTRONICALLY EXCITED BROMINE AND IODINE ATOMS Ph.D. Thesis
Gary Lawrence Wolk 1978 206 p
Avail: Univ. Microfilms Order No. 7902382

The deactivation of electronically excited bromine and iodine atoms Br(4 2P1/2) and 1 (5 2P1/2) in the gas phase upon collision with diatomic and polyatomic molecules was studied using time-resolved atomic resonance absorption spectroscopy. The atoms were produced by flash photolysis of alkyl halides. Topics covered include the determination of the removal rate of constants for quenching the bromine atom by H2, HD, and D, and the deactivation of the iodine atom by CH4, C3H8, HBr, DBr, and Br2. The results of these experiments are discussed in the context of a new interpretation of the one-electron correlation diagram. The use of long-range electronic-to-vibrational energy transfer theory to describe these processes is shown to be inappropriate. Finally, more quantitative classical and semi-classical theories which employ surface hopping for analytic continuation techniques are discussed. Dissert. Abstr.

N79-16658 Florida Univ., Gainesville.
A PROJECTED HAMILTONIAN APPROACH TO POLYATOMIC SYSTEMS Ph.D. Thesis
Jack Allen Smith 1978 125 p
Avail: Univ. Microfilms Order No. 7900096

A method of treating polyatomic systems, finite or extended, is presented which fully exploits their atom-in-molecule nature. Within an independent-particle model a partitioning technique is applied to the projection of the full polyatomic space into many atomic subspaces. The subspaces are then each coupled to one another approximately through second-order in overlap in a piecewise self-consistent fashion. Molecular orbitals and energies may be obtained from an approximate electron propagator which is based on a model Hamiltonian built up from atomic one-electron Hamiltonians in diagonal form. Symmetric orthonormalization of these orbitals gives a density matrix which can be used as a guide for charge redistribution within the system. A generalization of the Hartree-Fock approximation based on a statistical ensemble is employed which permits the use of fractional occupation numbers in the atomic configurations. Application of the method here includes the nitric oxide molecule and its chemisorption on a nickel(100) surface. Dissert. Abstr.

N79-16659 Maryland Univ., College Park.
AN EXPERIMENTAL INVESTIGATION OF THE He(+)-CO2 CHARGE EXCHANGE COLLISION Ph.D. Thesis
Michael Rory McMillan 1978 173 p
Avail: Univ. Microfilms Order No. 7900919

The dissociative charge exchange collision between He(+) and CO2 was investigated by means of a crossed-beam scattering experiment. Relative cross sections differential with respect to energy and angle were measured for the fragments O(+), CO(+), and C(+), for He(+) in the range 8.7 eV to 200 eV. For He(+) kinetic energies above about 20 eV, it was found that the charge exchange is near-resonant. It is possible to identify the state of CO2(+) produced and to predict the branching ratios for the ionic fragments using the quasiequilibrium theory of mass spectra. For He(+) energies below about 20 eV, it was found that the collision proceeds via a long-lived complex. Complex formation is usually not observed at this high an energy. A model for this process coupling dissociation with inelastic energy transfer is proposed. Dissert. Abstr.

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N79-16660 California Univ., Los Angeles.
ANTIPROTON PRODUCTION FROM ELECTRON-POSITRON COLLIDING BEAMS AT SPEAR AT 5.2 GeV Ph.D. Thesis
Donald Allen Berk 1978 102 p
Avail: Univ. Microfilms Order No. 7901334

The production of antiprotons from 2.6 GeV/c x 2.6 GeV/c electron-positron colliding beams was measured. An array of scintillation counters was used to detect events bearing antiproton annihilation characteristics, with timing and pulse-height data for each event being accumulated by an on-line computer with storage onto magnetic tape. Analysis for 2 x 10.00 nb time integrated luminosity yields a single, background free antiproton-like event with a cross section of 0.5 nb. An upper limit of 2 nb is established with 90% confidence. Dissert. Abstr.

N79-16661*# Grambling State Univ., La. Dept. of Physics.
NUCLEAR QUADRUPOLE RESONANCE STUDIES PROJECT Final Technical Report
A. Narasimha Murty [1978] 54 p refs
(Grant NGR-19-011-016)
(NASA-CR-158077; GSU-5-5175) Avail: NTIS HC A04/MF A01 CSCL 18D

The participation of undergraduates in nuclear quadrupole resonance research at Grambling University was made possible by NASA grants. Expanded laboratory capabilities include (1) facilities for high and low temperature generation and measurement; (2) facilities for radio frequency generation and measurement with the modern spectrum analyzers, precision frequency counters and standard signal generators; (3) vacuum and glass blowing facilities; and (4) miscellaneous electronic and machine shop facilities. Experiments carried out over a five year period are described and their results analyzed. Theoretical studies on solid state crystalline electrostatic fields, field gradients, and antishielding factors are included. A.R.H.

74 OPTICS

Includes light phenomena.

N79-16662 Texas A&M Univ., College Station.
AN ELECTRO-OPTIC LIGHT SCATTERING PHOTOMETRIC POLARIMETER Ph.D. Thesis
Randall Clyde Thompson 1978 118 p
Avail: Univ. Microfilms Order No. 7901019

The angular dependence of the radiance and polarization of light scattered by a suspension of small particles depends on the polarization of the incident light. This dependence, which in general cannot be computed, can be represented by a sixteen element, square matrix. The instrument to be described here is capable of the direct and simultaneous measurement of all sixteen elements of this matrix. It thus provides a tremendous improve-

ment over all previous efforts to measure the scattering matrix. Polarization modulation is used as the basis for this instrument. A theoretical description of the optical system is given as well as a detailed procedure for alignment of the optics and electronics. To demonstrate the precision of the instrument, measurements of various optical devices and scattering systems are presented.
Dissert. Abstr.

N79-16663 Oklahoma Univ., Norman.
MICRO-OPTICAL TOMOGRAPHY Ph.D. Thesis
Albert Durr Edgar 1978 237 p
Avail: Univ. Microfilms Order No. 7824588

A deeper vision than is possible with an optical microscope is provided by micro-optical tomography which gives much of the depth clarity of an electron microscope without requiring the vacuum, dehydrated, lifeless environment of electron microscopy. Living cells can be viewed and life dynamics visualized by digitizing an image from an optical microscope while focus and viewing angle are scanned to form a multi-dimensional image matrix. Where the power of optical transforms end, sequential scanning and the computer are used to reconstruct the wealth of detail born by light emanating from the subject. Reconstruction can take the form of optical dissection, or of imaging a dimensional object with elemental detail to 1/4 the wavelength of light in all planes of focus on one image. Dissert. Abstr.

N79-16664*# Advanced Kinetics, Inc., Costa Mesa, Calif.
OPTICAL EFFECTS MODULE Final Report
1 Oct. 1978 80 p
(Contract NAS8-32090)
(NASA-CR-150908) Avail: NTIS HC A05/MF A01 CSCL 20F

The possible degradation of optical samples exposed to the effluent gases and particulate matter emanating from the payload of the space transportation system during orbital operations may be determined by measuring two optical parameters for five samples exposed to this environment, namely transmittance and diffuse reflectance. Any changes detected in these parameters as a function of time during the mission are then attributable to surface contamination or to increased material absorption. These basic functions are attained in the optical effects module by virtue of the following subsystems which are described: module enclosure; light source with collimator and modulator; sample wheel with holders and rotary drive; photomultipliers for radiation detection; processing and sequencing electronic circuitry; and power conditioning interfaces. The functions of these subsystems are reviewed and specified. A.R.H.

N79-16665# Sira Inst. Ltd., Chislehurst (England).
DEVELOPMENT STUDY FOR A HIGH ACCURACY STAR SENSOR. VOLUME 3: EVALUATION OF CRITICAL PROPERTIES OF CCD AND CID IMAGE SENSORS
D. J. Purll Paris ESA Apr. 1978 161 p
(Contract ESTEC-2454/75)
(ESA-CR(P)-923-Vol-3) Avail: NTIS HC A08/MF A01

Two critical characteristics of CCD and CID image sensors, the aperture response of individual elements, and the element-to-element non-uniformities of both response and dark current were investigated. Element aperture responses were mapped by scanning a small spot of light across the elements. This work proved that non-smoothness in the response profiles can be explained by predictable optical and electro-optical effects, such as the effects of surface layers and different photon penetration depths. The non-uniformity results show that dark current non-uniformity will be the limiting noise on the detectability of, and tracking accuracies obtained with, small star signals. Dark current and its non-uniformity for state of the art devices are greater than the minimum star signals to be used in the high accuracy sensor. Dark current does not behave simply with time and temperature variations as suggested in most previous literature. A.R.H.

N79-16666# Royal Aircraft Establishment, Farnborough (England).
A TECHNIQUE FOR OBTAINING FILM THRESHOLD MODULATION
Madeline J. Fryer Oct. 1977 43 p refs
(RAE-TM-IT-166; BR61428) Avail: NTIS HC A03/MF A01

A method is described for determining the minimum depth of modulation required in the image of a test target, at any given spatial frequency, for it to be just resolved by an observer. Topics covered include: preparation of the camera; production of target images; sensitometric tests, film processing; density measurements; resolution readings; and processing plotting the target modulation versus the peak resolution to obtain the threshold modulation curve. Resolution results are presented in tables and graphs. A.R.H.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-16667 Texas Univ. at Austin.
AN EXPERIMENTAL INVESTIGATION OF CURRENT DRIVEN TURBULENCE IN A LOW DENSITY TORUS Ph.D. Thesis
Rex David Richardson 1978 224 p
Avail: Univ. Microfilms Order No. 7900622

A toroidal confinement device of 68 cm major radius, 4 cm minor radius and one kilogauss magnetic field was used to study current driven turbulence in low density hydrogen, helium, argon, and krypton plasmas. The steady state initial plasma was subjected to step-function toroidal electric fields of 1-100 volts/cm. Electrons freely accelerate up to ten times their initial thermal velocity until collective instabilities set in producing a state of anomalous resistivity. Resistivities of several ohm cm which remain reasonably constant during the 1 microsec pulse, were measured. Heating rates of 100 keV/microsec and temperatures of 10 keV were recorded. The distributions exhibit several strong beam-like structures which persist throughout the entire pulse. Preliminary measurements of the fluctuation spectra using double electric probes reveal a broad and complex spectrum with peaks at mega sub pe and omega sub pe/2.
Dissert. Abstr.

N79-16668 Florida Univ., Gainesville.
MHD GENERATOR DUCT FLOW WITH CROSS STREAM DEPENDENT FLUID PROPERTIES Ph.D. Thesis
Thomas Albert Trovillion 1978 207 p
Avail: Univ. Microfilms Order No. 7900099

The problem of steady laminar flow of an incompressible viscous conducting fluid in a rectangular duct is considered with finite aspect ratio of the cross section. An external magnetic field is applied transverse to the flow in a Faraday generator configuration. The governing equations for the modeling of the working fluid are derived from the usual magnetohydrodynamic assumptions yielding two simultaneous equations in terms of the velocity and induced magnetic field. A finite difference approach is taken to the solution of these equations using a modification of the Peaceman Rachford alternating direction implicit relaxation scheme. The finite difference solution is employed to obtain plots of the current streamlines and velocity contours, the volume flow rate through the channel, and the efficiency of the generator. These results are then examined to determine the effect on the flow characteristics produced by changes in load resistance, electrode conductivity, aspect ratio, and the assumed profile of conductivity and viscosity variation.
Dissert. Abstr.

N79-16669# Nagoya Univ. (Japan). Inst. of Plasma Physics.
POPULATION INVERSION IN RECOMBINING HYDROGEN PLASMA
Utaro Furukane, Toshiaki Yokota, and Toshiatsu Oda (Hiroshima Univ.) Nov. 1978 26 p refs
(IPPJ-358) Avail: NTIS HC A03/MF A01

The collisional-radiative model is applied to a recombining hydrogen plasma in order to investigate the plasma condition in which the population inversion between the energy levels of hydrogen can be generated. The population inversion is expected in a plasma where the three body recombination has a large contribution to the recombining processes and the effective recombination rate is beyond a certain value for a given electron

density and temperature. Calculated results are presented in figures and tables. Author

N79-16670# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPLEMENTARY VARIATIONAL PRINCIPLES ON ELECTRICAL CONDUCTIVITIES OF A PLASMA IN A UNIFORM MAGNETIC FIELD
Shobu Kaneko Nov. 1978 21 p refs
(IPPJ-359) Avail: NTIS HC A03/MF A01

Several functionals, whose Euler-Lagrange equations are the kinetic equations for the velocity distribution functions, are derived. The extremal values of these functionals are proved to be proportional to the ohm conductivity or to the Hall conductivity. The complementary variational principles, which give both lower and upper bounds for both conductivities, are derived by use of these functionals. These principles are applied to a plasma composed of electrons and singly charged positive ions. A.R.H.

N79-16671# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PARAMAGNETISM OF THE PLASMA IN THE RADIO-FREQUENCY FIELD
Y. Ohsawa, M. Inutake, T. Tajima (California Univ., Los Angeles), T. Hatori, and T. Kanimura Oct. 1978 37 p refs Sponsored in part by NSF and DoE
(IPPJ-357) Avail: NTIS HC A03/MF A01

The response of a plasma to an external RF magnetic field with m=1 was investigated. The magnetic field has frequency omega near the local ion cyclotron frequency and is applied perpendicular to a static magnetic field. Paramagnetism is demonstrated by both computer simulation and experiment, when omega is less than the eigen-frequency of shear Alfven, ion cyclotron or electrostatic ion cyclotron mode. The range omega less than omega sub m is of interest concerning RF plugging and homogeneous RF heating of plasma. A.R.H.

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N79-16672 Texas A&M Univ., College Station.
DEFLECTION EFFECTS AND CHARGE TRANSFER IN INNER-SHELL VACANCY PRODUCTION Ph.D. Thesis
Gerald Lee Swafford 1978 146 p
Avail: Univ. Microfilms Order No. 7901011

A method used in the calculation of inner shell ionization in asymmetric ion-atom collisions was extended to include projectile deflection effects and charge transfer to the projectile. Work was done in an independent electron model (Hartree-Fock) for the target, and the interaction was treated with the projectile as a time dependent perturbation of the system. The method was first applied to the impact-parameter dependence of K-shell ionization by protons incident upon copper in the energy range 0.5 to 2 MeV. The projectile was then considered to move in a straight line path with constant velocity, and the method was extended to include charge transfer between the target inner shell and the K-shell of the projectile. A critical feature of the results is the recognition of the importance of target continuum states of energy approximately equal to the kinetic energy (in the target frame) of the electron on the projectile. Dissert. Abstr.

N79-16673 Brandeis Univ., Waltham, Mass.
THE ELECTRON COMPTON DEFECT OBSERVED IN He, H2, D2, N2 AND Ne PROFILES: A REEVALUATION OF THE BINARY ENCOUNTER THEORY Ph.D. Thesis
Wolfgang Heinz Ernst Rueckner 1978 297 p
Avail: Univ. Microfilms Order No. 7819957

The Compton defect was studied in detail for momentum transfers from 1.5 to 12 a.u. for both He and H2. Defect measurements for D2, N2, and Ne were made and it was found that the N2 and Ne defects were opposite in direction from the He and H2 defects. The D2 defect was identical to the H2 measurement. The electron Compton defect is discussed in relation to other recent defect measurements using X-ray and (e, 2e) techniques as well as recent theoretical results. An evaluation of the theory used to convert cross-sections to Compton profiles is presented and, on the basis of the defect measurements, it is suggested that, even when binary encounter conditions were attained at large momentum transfers, the binary encounter theory breaks down in the high accuracy limit. Dissert. Abstr.

N79-16674 Montana State Univ., Missoula.
RADIATIVE MEAN LIFETIME MEASUREMENT IN N = 2 HYDROGEN Ph.D. Thesis
Edward Frank Kelley 1978 160 p
Avail: Univ. Microfilms Order No. 7823184

The lifetime of the 2 2P sub 1/2 state in hydrogen by monitoring the Lyman-alpha radiation produced from the decay of the p-state atoms in a fast beam of hydrogen atoms (approximately 100 keV) was studied. Information obtained from observations of the field-free decay and the field-induced decay of the p state in a uniform field (giving rise to quantum beats) is combined to yield a value for the lifetime without measuring the beam velocity independently. The quantum-beat curves are fit taking into account contributions from both the fringe field and the hyperfine structure. The fringe field of the uniform field region is treated approximately using an analytical solution of the problem for hyperbolic-secant-model fringe field. The resulting value of the lifetime is three percent lower than theory and previous experiment. Possible sources of error are discussed. Dissert. Abstr.

N79-16675 Indiana Univ., Bloomington.
STUDIES OF TRANSITIONS BETWEEN ZEEMAN SUBLEVELS OF THE POTASSIUM 4P STATES INDUCED BY NONRESONANT THERMAL COLLISIONS AT HIGH MAGNETIC FIELDS Ph.D. Thesis
Richard Dale Boggy 1978 84 p
Avail: Univ. Microfilms Order No. 7900377

Experiments which examine the response of selectively excited potassium atoms to thermal collisions with inert gas atoms at magnetic fields between 9 and 31 kOe were performed. Using laser excitation of individual Zeeman sublevels of the potassium 4P states and interferometric analysis of fluorescent light, cross sections for excitation transfer between the potassium 4 2P sub 1/2 and 4 2P sub 3/2 fine-structure states and for depolarization of each of the fine-structure states were determined. The experimental results for helium and neon collision partners are presented both as cross sections for transitions between individual magnetic sublevels and as irreducible cross sections for multiple depolarization, excitation transfer, and coherence transfer. Dissert. Abstr.

N79-16676 Montana Univ., Missoula.
COMPUTATION OF SURFACE STATES ON bcc TRANSITION METALS Ph.D. Thesis
Mizuho Kawajiri 1978 102 p
Avail: Univ. Microfilms Order No. 7823183

The resolved method is combined with a tight-binding model in order to obtain layer-by-layer densities of states at low index surfaces of semi-infinite bcc transition metals. Shockley-type localized surface states or resonances are found in all hybridization gaps in the three symmetry directions studied. Prominent structures in the angle-resolved polarization dependent photoemission spectra are discussed in the light of present calculation. In assigning peaks of an observed EDC to calculated initial state features, a knowledge of the final state symmetry and selection rules is extremely important. Dissert. Abstr.

N79-16677 City Univ. of New York.
INVESTIGATION OF K(*) PRODUCTION BY GeV/c K(-) INCIDENT ON LIQUID HYDROGEN Ph.D. Thesis
Usha Mallik 1978 202 p
Avail: Univ. Microfilms Order No. 7900797

The reaction negative kaon + proton yields neutral kaon resonance positive pion negative pion + neutron at an incident negative kaon momentum of 6 GeV/c was studied using a multi-particle spectrometer facility. The neutron recoil was obtained by selecting on the missing mass. The data sample consisted of approximately 14,000 events and represents the largest statistics in the short-life neutral kaon decay negative pion positive pion mode in any experiment performed so far. The short-life neutral kaon decay negative pion positive pion

(1420) peak as well as a second peak at approximately 1750 MeV were observed in the short-life neutral kaon decay negative pion positive pion effective mass spectrum. The total cross sections for both the peaks were obtained. The 1420 mass region was studied at various t intervals and the differential cross section as a function of t was calculated. Dissert. Abstr.

N79-16678* National Aeronautics and Space Administration. Pasadena Office, Calif.

MANGANESE BISMUTH FILMS WITH NARROW TRANSFER CHARACTERISTICS FOR CURIE-POINT SWITCHING Patent

George W. Lewicki (JPL) and John E. Guisinger, inventors (to NASA) (JPL) Issued 24 Sep. 1974 9 p Filed 1 Nov. 1972 Continuation-in-part of abandoned US Patent Appl. SN-57439, filed 23 Jul. 1970; sponsored be NASA (NASA-Case-NPO-11336-1; NASA-Case-NPO-13247-1; US-Patent-3,837,908; US-Patent-Appl-SN-302913; US-Patent-Class-117-239; US-Patent-Class-75-134D; US-Patent-Class-117-107; US-Patent-Class-117-119; US-Patent-Class-117-234; US-Patent-Class-117-235; US-Patent-Class-117-237; US-Patent-Class-117-240; US-Patent-Class-148-6; US-Patent-Class-148-121) Avail: US Patent and Trademark Office CSCL 20L

Manganese bismuth films having improved characteristics for recording information in analogue form, can be produced by a vacuum deposition of Bi and Mn with an atomic ratio of Mn to Bi between 2 and 3.5 or 1.4 and 1.6, followed by a specialized heat treatment which includes very brief exposure to a temperature between about 275 deg and 300 C. Similar MnBi films can be produced more reliably and reproducibly if the initial Bi layer is annealed prior to deposition of the Mn layer. Such an annealing step renders most other factors of the processing relatively non-critical. Deposition of both initial layers is preferably carried out in a vacuum approaching 10 to the -8th power Torr.

Official Gazette of the U.S. Patent and Trademark Office

N79-16679 Cornell Univ., Ithaca, N. Y.

THE VISCOSITY AND SUPERFLUID DENSITY OF He-3 TO ONE MILLIKELVIN Ph.D. Thesis

Charles Neill Archie 1978 101 p

Avail: Univ. Microfilms Order No. 7902254

A torsional oscillator and a vibrating wire viscometer, both operating in a self resonating fashion by means of electronic feedback circuits were contained in an experimental cell along with a thermometer in order to systematically study the pressure and temperature dependencies of the viscosity and superfluid density in the superfluid phases of He3. Measurements reported range from 2.0 to 29.0 bar in pressure and down to 1.0 mK in temperature. Normal state viscosity determined by the two viscometers are consistent and indicate a pressure dependence to the coefficient eta sq T that differs from earlier measurements. Dissert. Abstr.

N79-16680 New Hampshire Univ., Durham.

A KINETIC THEORY OF WEAK WAVE-PARTICLE INTERACTIONS IN AN AURORAL PLASMA Ph.D. Thesis

Paul Berton Dusenberry 1978 191 p

Avail: Univ. Microfilms Order No. 7824545

Experimental measurements of the electron distribution function are used to model the auroral plasma at an altitude of 250 km. A kinetic theory of weak wave-particle interactions in such a plasma is formulated when the waves are electrostatic in nature. The dispersion of these waves in k-space is found. The observed plasma is shown to be stable to electrostatic waves that propagate exactly parallel or perpendicular to the earth's magnetic field. The measured distribution function has a secondary peak, but this peak is either too small or too limited in extent to drive parallel or perpendicular instabilities. A methodology is developed to look at the stability of oblique electrostatic waves that are coupled to the measured distribution function.

Dissert. Abstr.

N79-16681 Maryland Univ., College Park.

GYROHARMONIC EMISSIONS INDUCED BY ENERGETIC PARTICLES IN MAGNETOSPHERIC PLASMAS Ph.D. Thesis

Steven Andrew Curtis 1978 156 p

Avail: Univ. Microfilms Order No. 7900913

The excitation of electromagnetic and electrostatic electron-cyclotron and ion-cyclotron harmonic waves are investigated for the types of two component plasmas known to exist in the terrestrial magnetosphere. The results of these investigations are then compared with satellite measurements. Dissert. Abstr.

N79-16682 Johannes Kepler Universitaet, Linz (Austria).

HIGH ELECTRIC FIELD TRANSPORT IN LEAD TELLURIDE Ph.D. Thesis

Janis Rozenbergs 1978 104 p

Avail: Univ. Microfilms Order No. 7901223

The high electric field properties of charge carrriers in both n and p-PbTe were studied. Measurements of the carrier drift velocity and Hall coefficient were made as a function of the crystal direction. Hall coefficient measurements indicated that the carrier concentration remained constant to the threshold electric field, whereupon there was an avalanche increase in carriers density by impact ionization. The carrier generation rate was measured and compared with calculations. The invariance of the instability with crystal direction indicated that the equivalent intervalley scattering was not significant in accounting for them. Possible instability mechanisms arising from both bulk and contact effects were discussed. Above the threshold electric field the Hall coefficient changed sign for n-PbTe, while remaining constant in p-material. Dissert. Abstr.

N79-16683 Oklahoma Univ., Norman.

ELECTROMAGNETIC PROPERTIES OF THIN FILM LEAD SUPERCONDUCTORS Ph.D. Thesis

Koji Moriyama 1978 201 p

Avail: Univ. Microfilms Order No. 7824607

The dependence of critical film magnetic field on temperature, thickness, and surface texture of lead superconducting films was investigated, as well as the relationship between the applied magnetic field and the applied current at the critical field. The values of H sub cf of lead films deposited on a rough surface were consistently lower than for those on a smooth surface and so were not in agreement with any currently accepted theory. The degree of lowering of H sub cf by a rough surface was greater in thin films than in thick films. The expected dependence of penetration depth on thickness was not observed.

Dissert. Abstr.

N79-16684 State Univ. of New York at Albany.

NUCLEAR QUADRUPOLE INTERACTIONS IN SEMI-METALLIC, AMORPHOUS AND MOLECULAR SOLIDS Ph.D. Thesis

Ayodele Joseph Coker 1978 140 p

Avail: Univ. Microfilms Order No. 7900220

The role of intermolecular bonding in solid halogens is studied using the self-consistent charge extended Huckel procedure (SCCEH). It was found that incorporating the (n+1)s and nd atomic orbitals where n = 3, 4, 5 for chlorine, bromine and iodine respectively in the basis set employed in the calculation leads to values of the asymmetry parameter in good agreement with experiment. The SCCEH procedure was also used to calculate the electronic wavefunctions for the systems, tellurium chain and tellurium atom present as a substitutional impurity in selenium chain and selenium and sulfur rings. Using these wavefunctions, the electric field gradients at the Te125 nucleus in all these four systems is investigated. The electronic band structure of tellurium was calculated as well as the ratio of the isomer shifts for Te125 in selenium and sulfur rings referred to the tellurium chain. Dissert. Abstr.

N79-16685 Pennsylvania Univ., Philadelphia.

PHASE TRANSITIONS IN GAUGE COUPLED SYSTEMS Ph.D. Thesis

Jing-Huei Chen 1978 125 p

Avail: Univ. Microfilms Order No. 7824705

The renormalization group approach is used to study a special universality class in which the order parameter is coupled to a gauge field. Besides the global symmetry there is the local symmetry associated with the gauge coupling. Mean field theory predicts a second order transition; however, fluctuations of the gauge field coupling to the order parameter lead to a slightly first order transition in most instances. For the case of liquid

crystals, a phenomenological model, is developed which exhibits a nematic to smectic transition, and a Lifshitz point. For the case of superconductor, crossover behavior in the vicinity of the fluctuation induced first order transition is studied. The deviation of the transition temperature from the limit of metastability of the disordered phase from above is found to be somewhat smaller than predicted by naive scaling. Dissert. Abstr.

N79-16686 California Univ., Santa Cruz.
THE PARAELECTRIC RESONANCE OF LITHIUM DOPED POTASSIUM-BROMIDE Ph.D. Thesis
Robert John Russell 1978 252 p
Avail: Univ. Microfilms Order No. 7900831

An extended microwave spectrometer was used to study lithium-doped potassium bromide. A harmonic generation and detection system with capability up to 217 GHz yielded a strong spectrum for KBr:Li6(+) and detailed data on KBr:Li7(+). The identification of the impurity as lithium is based in part on the similarity in the spectrum of these two species. A 40% isotope shift for Li6(+) is comparable to the isotope shift in KCl:Li(+) - a well known tunneling system. The size of the shift indicates that it is single lithium which is tunneling, given the exponential mass dependence of the tunnel splitting. A series of heat-treatment and second-impurity diffusion experiments on KBr:Li(+) indicate that OH(-) and possibly other impurities, suppress the lithium signal, and that quenching can greatly enhance the signal (by a factor of 100-1000). Dissert. Abstr.

N79-16687 California Univ., Los Angeles.
EXPERIMENTAL INVESTIGATION OF HOT ELECTRON EMISSION FROM A SILICON p-n JUNCTION FROM 100 TO 300 DEG K Ph.D. Thesis
James Ralph Schwank 1978 171 p
Avail: Univ. Microfilms Order No. 7901397

The hot electron mean free paths for optical phonon emission and impact ionization were measured in silicon from 100 to 300 K. Energy distributions of hot electrons emitted into vacuum from a reverse biased p-n junction located below and parallel to an n-type emitting surface were measured as a function of the n-layer thickness and temperature. The n-layer thickness was reduced in calibrated steps by argon sputtering. After each sputtering the surface was annealed and activated with cesium and oxygen to reduce the work function to 1.25 eV. Energy distributions, for several reverse biases and temperatures, were then measured. An electron mean free path for optical phonon emission of 152A at 293 K and 236A at 200 K and an electron mean free path for impact ionization of 5300A at 293 K and 1920A at 200 K were found for an electron distribution with an average energy of 2.2 eV above the conduction band minimum. Dissert. Abstr.

N79-16688 Cornell Univ., Ithaca, N. Y.
SUPERFLUIDITY IN REDUCED DIMENSIONALITY SYSTEMS Ph.D. Thesis
David John Bishop 1978 148 p
Avail: Univ. Microfilms Order No. 7902258

The superfluid density for HE4 films adsorbed in two different geometries was studied. With Vycor glass, using a third sound technique, phonons with a T squared temperature dependence were observed. These are attributed to the cylindrical nature of the Vycor pores. Also observed were rotons with a 5 K energy gap. HE4 films adsorbed in porous Vycor glass near their critical points were studied using an Andronikashvili method. The superfluid density was found to vary as a power law in reduced temperature with an exponent equal to the bulk value. This three-dimensional critical behavior was attributed to the three-dimensional interconnections of the Vycor substrate. For HE4 films using a Mylar substrate with an Andronikashvili method, profound differences in the nature of the superfluid transition was observed. A sharply changing superfluid density at the transition was seen along with a peak in the superfluid dissipation. Dissert. Abstr.

N79-16689 Case Western Reserve Univ., Cleveland, Ohio.
ION MOTION IN SOLID HELIUM Ph.D. Thesis
Shing-Choy Lau 1978 113 p
Avail: Univ. Microfilms Order No. 7901526

Experimental studies are reported of the ion motion in an external electric field for a number of hcp He-4 crystals grown in a narrow range of molar volumes. Low field mobilities and high field nonlinear ion velocity-field relations were fit with anisotropic tensors. Preliminary results on bcc He-3 crystals are presented. Low field and high field behavior were compared in the framework of Andreev and Meierovich's theory that ion motion in solid helium proceeds via vacancy scattering with the simultaneous spontaneous emission of a phonon at high fields. Effects of crystal strain on space charge limited currents are studied. Dissert. Abstr.

N79-16690 Case Western Reserve Univ., Cleveland, Ohio.
MOESSBAUER EFFECT EMISSION AND AES STUDY OF THE Ni (111) SURFACE Ph.D. Thesis
Charles Robert Anderson, Jr. 1978 164 p
Avail: Univ. Microfilms Order No. 7901506

Monolayers (ML) of Co57 were deposited on a (111) Ni surface held below 190 K during evaporation. The evaporation caused 0.2 ML Fe, 0.1 ML Cu, 0.2 ML O, and 0.4 ML C contamination of the surface. The MEES spectra showed a very broad resonance over the velocity range of plus or minus 6 mm/sec with a central depth of 4%. The spectra are interpreted as arising from a broad distribution of magnetic hyperfine fields. The presence of hyperfine fields as large as those of F237 in bulk nickel is required to explain the significant absorption at higher absolute velocities. Hyperfine field at the (111) nickel surface sites is comparable to that in bulk nickel. Deviations are due largely to the presence of contaminants. Local site environments have hyperfine fields which scale as those for similar bulk compositions. There are certainly no dead layers, not even on a surface with a monolayer of contaminant. Dissert. Abstr.

N79-16691 Texas Univ. at Austin.
OPEN-ORBIT ELECTRONS AND ULTRASONIC DISPERSION IN COPPER Ph.D. Thesis
Carroll Mannon Casteel 1978 121 p
Avail: Univ. Microfilms Order No. 7900543

Dispersion effects due to open-orbit electrons in copper were studied. The theoretical study developed the theory of Kadanoff and Pippard for the electronic contribution to the stress tensor of a metal. The theory was then applied to the free-electron model of a metal, and the results were found to agree with previous studies of this case. The theory was then applied to open-orbit electrons in a real metal using the free-electron theory to give a closed orbit background to the dispersion. The results of the theory were compared to the experiment by using a four function fit to the energy shift caused by the deformation potential of copper. Reasonable agreement was found for the approximations used. The observance of anomalous propagation of ultrasound by open-orbit electrons was discussed by the use of a simple model. Dissert. Abstr.

N79-16692 Georgia Inst. of Tech., Atlanta.
OPTICAL REFLECTIVITY AND AUGER SPECTROSCOPY OF TITANIUM AND TITANIUM-OXYGEN SURFACES Ph.D. Thesis
William Edgar Wall 1978 171 p
Avail: Univ. Microfilms Order No. 7824909

Two experimental developments of the last decade, Auger electron spectroscopy (AES) and synchrotron radiation were combined with an ultra-high-vacuum apparatus to allow optical measurements over a wide spectral range while monitoring and controlling the surface environment of the sample. An automated computer-based data acquisition system was developed to allow fast optical and AES measurements, insuring the stability of the surface during the measurement period. Using this apparatus, the reflectances of both atomically clean and in situ oxidized titanium surfaces were measured over a photon energy range of 2 to 25 eV. From these data the optical constants were calculated and then related to theoretical calculations of the electronic structure of titanium and titanium oxide. Dissert. Abstr.

N79-16693 North Texas State Univ., Denton.
ROOM TEMPERATURE GOLD-VACUUM-GOLD TUNNELING EXPERIMENTS Ph.D. Thesis
Edgar Clayton Teague 1978 229 p
Avail: Univ. Microfilms Order No. 7824678

Quantum mechanical tunneling of electrons between two gold electrodes separated in vacuum was demonstrated. The tunneling current between the gold electrodes was measured, for fixed voltages of 0.1 and 0.01 volts, as the electrode spacing was varied from a distance of approximately 2.0 nm down to a point where the electrodes touched. Current-voltage characteristics for fixed electrode spacing in the direct tunneling region were also measured. Numerical calculations of the tunneling current based on the free-electron model of the electrodes and the barrier, an image-potential reduced barrier, and a WKB approximation for the tunneling probability were performed and compared with Simmons' theory and with the experimental results. The vacuum tunneling technique can be utilized in the field of metrology as a tool to locate the true position of a surface to a precision of 0.1 nm, 10 to 100 times greater than presently available techniques. Dissert. Abstr.

N79-16694 Montana State Univ., Missoula.
TIGHT-BINDING METHODS FOR THE STUDY OF SURFACE STATES ON SEMICONDUCTORS Ph.D. Thesis
William Arthur Schwalm 1978 133 p
Avail: Univ. Microfilms Order No. 7823187

The unifying concept which relates essentially all of the methods which currently appear in the literature for computing surface electronic structure from a given, tight-binding Hamiltonian is shown to be the difference equations satisfied by the Green functions. An efficient, generating function formalism is developed through which the analytic resolvent method of Levine and Freeman may be extended in order to solve more realistic surface problems. Two model Hamiltonians are completely solved in order to demonstrate this method. A bulk, bond-orbital model proposed by Pantelides and Harrison is used to study eigenstates of a twelve layer film of (110) GaAs. The results compare well with those of calculations which do not make bond-orbital approximations. Results are discussed and compared with those of other investigations. Dissert. Abstr.

N79-16695 Saint Johns Univ., Jamaica, N. Y.
EXPERIMENTAL STUDIES OF RESISTIVE TRANSITION TO SUPERCONDUCTIVITY IN THIN FILMS OF THALLIUM AND TIN Ph.D. Thesis
Arun Kumar Saxena 1978 97 p
Avail: Univ. Microfilms Order No. 7900281

The effect of thermodynamic fluctuations of the superconducting order parameter on the resistive transition to the superconducting state in thin films of thallium and tin was investigated. The excess electrical conductivity alpha prime in thin films was measured above the transition temperature T sub c in the absence and presence of magnetic fields. Dissert. Abstr.

N79-16696 Case Western Reserve Univ., Cleveland, Ohio.
PIEZORESISTIVE PROPERTIES OF BORON AND PHOSPHOROUS IMPLANTED LAYERS IN SILICON Ph.D. Thesis
Shao-Fu Chu 1978 220 p
Avail: Univ. Microfilms Order No. 7901508

The piezoresistive properties, resistivity and Hall mobility of boron and phosphorus implanted layers in silicon for the dose range from 10 to the 13th power to 2 x 10 to the 15th power/cu cm were determined as functions of the temperature used in the thirty minute annealing treatment. From high to low annealing temperatures, two distinct annealing regions were identified with regard to changes in the magnitude of pi sub 11 and pi sub 12 for phosphorus implants and pi sub 44 for boron implants. The study provides useful information needed for fabricating piezoresistive devices using the ion implantation technique. Some practical considerations concerning pressure transducer design are also given. Dissert. Abstr.

N79-16697 Virginia Univ., Charlottesville.
THE FRACTURE OF BERYLLIUM SINGLE CRYSTALS Ph.D. Thesis
Thomas Cole Pollock 1977 127 p
Avail: Univ. Microfilms Order No. 7901153

The microstructural aspects of the fracture of beryllium metal were studied. High purity beryllium single crystals were strained to fracture in situ in the 500 keV transmission electron microscope. The orientations of these crystals were chosen so that both ductile fracture and cleavage on the basal plane could be studied. It was determined that cleavage was preceded by plastic flow. There were also indications that the cleavage crack was not completely elastic in character. Ductile fracture occurred by the initiation, growth, and coalescence of holes within the material. The sites of crack initiation were dislocation cell boundaries. The separation of cell boundaries into microcracks was a rapid process resembling brittle fracture. The growth of holes was caused by glide on two or more prism systems, and final separation of the material remaining between the holes was by ductile rupture. Dissert. Abstr.

N79-16698*# Bendix Corp., Teterboro, N. J. Flight Systems Div.
MULTIPURPOSE PANEL DISPLAY DEVICE INVESTIGATION Final Report
R. Sliwa Jul. 1977 31 p refs
(Contract NAS8-32361)
(NASA-CR-150438; FSD-7411-77-11) Avail: NTIS HC A03/MF A01 CSCL 20L

A multipurpose panel was developed to provide a flexible control and a LED display panel with easily changeable nomenclature for use in applications where panel space is limited, but where a number of similar subsystems must be controlled, or where basic panel nomenclature and functions must be changed rapidly, as in the case of between mission changes of space shuttle payloads. In the first application, panel area limitations are overcome by time sharing a central control panel among several subsystems. In the latter case, entire control panel changes are effected by simply replacing a memory module, thereby reducing the extent of installation and checkout procedures between missions. Several types of control technologies (other than LED's) which show potential in meeting criteria for overcoming limitations of the panel are assessed. A.R.H.

N79-16699*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF SINGLE-CRYSTAL MANGANESE-ZINC FERRITE
Kazuhisa Miyoshi and Donald H. Buckley 1979 19 p refs
To be presented at the Intern. Conf. on Wear of Mater., Dearborn, Mich., 16-18 Apr. 1979; sponsored by ASME, ASLE, ASM, ASTM-62, SAE, SME, Am. Chem. Soc., AIME, and APS
(NASA-TM-78980; E-9673-1) Avail: NTIS HC A02/MF A01 CSCL 20B

Sliding friction experiments were conducted with single crystal manganese-zinc ferrite in contact with itself and with transition metals. Results indicate mating highest atomic density directions (110) on matched crystallographic planes exhibit the lowest coefficient of friction, indicating that direction is important in the friction behavior of ferrite. Matched parallel high atomic density planes and crystallographic directions at the interface exhibit low coefficients of friction. The coefficients of friction for ferrite in contact with various metals are related to the relative chemical activity of these metals. The more active the metal, the higher the coefficient of friction. Cracking and the formation of hexagon- and rectangular-shaped platelet wear debris due to cleavages of (110) planes are observed on the ferrite surfaces as a result of sliding. Author

N79-16700# Defence Research Information Centre, Orpington (England).
AUTOMATED CRYSTAL PULLING EQUIPMENT FOR THE CZOCHRALSKI METHOD
D. Mateika, P. Flisikowski, H. Kohler, and R. Kilian Apr. 1978 24 p refs Transl. into ENGLISH from J. of Crystal Growth (Netherlands), v. 41, 1977 p 262-274
(DRIC-Trans-5248; BR45786) Avail: NTIS HC A02/MF A01

The construction of an automated crystal puller for the growth of single crystals at temperatures up to 2270 K is described as well as methods for operating the monitoring and control units for the mechanical drive and for the high frequency generator. The crystal puller has a withdrawal length of 350 mm and a chamber diameter of 500 mm. Uniformity of rotation and pulling rate are better than 1 per cent and the eccentricity of the pulling shaft does not exceed 26 micron. Heating is performed by a 25 kW rf generator. The shape, diameter, and length of the crystals are automatically controlled using an electrobalance coupled in a feed-back loop to the generator. Single crystals of

garnet of good quality with diameters of up to 65 mm and weights to 2.3 kg were grown with this equipment. A.R.H.

N79-16701# National Bureau of Standards, Washington, D. C.
STANDARD X-RAY DIFFRACTION POWDER PATTERNS, SECTION 15 DATA FOR 112 SUBSTANCES
Marlene C. Morris, Howard F. McMurdie, Eloise H. Evans, Camden R. Hubbard, and Simon J. Carmel Oct. 1978 208 p refs Sponsored in part by Joint Committee on Powder Diffraction Standards, Swathmore, Pa.
(PB-287182/0; NBS-Mono-25-Sect-15; LC-53-61386) Avail: NTIS HC A10/MF A01 CSCL 20B

Standard X-ray diffraction patterns are presented for 112 substances. Fifty-four of these patterns represent experimental data and 58 are calculated. The experimental X-ray powder diffraction patterns were obtained with an X-ray diffractometer. All d-values were assigned Miller indices determined by comparison with computed interplanar spacings consistent with space group extinctions. The densities and lattice constants were calculated and the refractive indices were measured whenever possible. The calculated X-ray powder diffraction patterns were computed from published crystal structure data. Both peak height and integrated intensities are reported for the calculated patterns. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-16702 Texas A&M Univ., College Station.
THERMODYNAMIC PROPERTIES OF ETHYLENE AND WATER IN THE CRITICAL REGION Ph.D. Thesis
Mohammad Sadegh Nehzat 1978 184 p
Avail: Univ. Microfilms Order No. 7900995

The thermodynamic tables of ethylene and water were revised in the critical region. The new tables are consistent with the Hall-Eubank formulation and are compatible with recent experimental measurements. An isochoric equation of state (EOS) was perfected for the single-phase region neqr the critical point (CP). Starting at the vapor-liquid coexistence curve, the EOS has an initial slope consistent with the power-law behavior for the difference of isochoric slopes issuing from the same point on the vapor pressure curve, and with the rectilinear behavior of their sum. The initial curvature of the EOS was found to be a sinusoidal function of density with a curvature near zero at the critical isochore. Dissert. Abstr.

N79-16703 Virginia Univ., Charlottesville.
CONDENSATION OF SATURATED VAPOR ONTO A VERTICAL MELTING SUBSTRATE Ph.D. Thesis
Patrick Lynn Garner 1977 154 p
Avail: Univ. Microfilms Order No. 7901134

Condensation of a pure, saturated vapor onto a vertical, melting substrate is analyzed for both one- and two-material situations. The condensate and melt regions are treated as laminar boundary layers in the steady-state analyses. The convective momentum and energy transport terms in the conservation equations and the shear stress at the condensate/vapor interface are found to be nonnegligible; neglection of these terms results in overestimating the phase-change rates by a factor of 2 to 3. The phase-change rates are reduced if the vapor is moving upward at low speed rather than stagnant. The models are applied to the specific case of uranium dioxide condensing onto solid stainless steel. Dissert. Abstr.

N79-16704 Oklahoma Univ., Norman.
THERMAL AND KINETIC ANALYSIS OF THE PYROLYSIS OF COALS Ph.D. Thesis
Vidyutkumar Vamanray Hathi 1978 275 p
Avail: Univ. Microfilms Order No. 7824598

The thermal decomposition (pyrolysis) of nine bituminous coals of the United States was investigated in a nitrogen atmosphere. Weight loss and rate of weight loss were measured at heating rates of 160, 80, 40, 20 and 10 C/min. The qualitative behavior of these data confirmed observations reported by others on similar coals in that the major devolatilization occurred between 300-700 C with the peaks shifting to higher temperatures at faster heating rates. Kinetic parameters for each heating rate were derived from these measurements by means of a model which was used successfully to describe the pyrolysis of woods and wildland fuels. The decomposition of bituminous coals is endothermic up to 500 C and exothermic thereafter; the energy of pyrolysis is more exothermic with decreasing heating rates. Dissert. Abstr.

N79-16705 Oklahoma Univ., Norman.
DEVELOPMENT OF EQUATIONS OF STATE FOR FLUIDS CORRELATION METHODOLOGY FOR THERMODYNAMIC AND PVT PROPERTIES, INCLUDING A CASE STUDY FOR WATER Ph.D. Thesis
Kevin Mansur Goin 1978 257 p
Avail: Univ. Microfilms Order No. 7824594

A correlation methodology for the development of equations of state containing large numbers of parameters is presented, with the development of a forty-three parameter equation of state for water presented as a case study. The methodology consists of six steps: (1) experimental data collection and selection of a working data set (subset), (2) determination of initial values of model parameters by regression on pressure, (3) parameter value improvement by regression on density, (4) development of base equation by multiproperty analysis of density, vapor pressure and enthalpy departure data, (5) model improvement by systematic removal of unnecessary terms, and (6) model validity check using the complete set of available thermodynamic data. Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N79-16706# Phelps-Stokes Fund, Washington, D. C.
COOPERATIVE EDUCATION: ENTREPRENEURIAL DEVELOPMENT BY COLLEGES AND UNIVERSITIES: A CASE STUDY OF BEREA COLLEGE, BEREA, KENTUCKY
Frank Kramer Dec. 1977 60 p refs
(Grant EDA-99-06-09589)
(PB-285559/0; EDA-78-0124) Avail: NTIS HC A04/MF A01 CSCL 05I

The entrepreneurial development and experiential education environments of Berea College, Berea, Kentucky, are described. The program is directed toward helping participating colleges establish profit-making enterprises to provide needed revenue for endowment or discretionary purposes; to broaden the college's appeal to prospective students; to supply a constant source of student aid through part-time employment opportunities; and to give students training for future careers through apprenticeships. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-16707 Pennsylvania Univ., Philadelphia.
A NORMATIVE MODEL OF R AND D PROJECT SELECTION UNDER UNCERTAINTY Ph.D. Thesis
Henry Ford 1978 286 p
Avail: Univ. Microfilms Order No. 7824719

A project selection and funding model is developed which incorporates the uncertainty of technical success and the uncertainty of commercial returns given technical success. It is assumed that the firm acts as a rational decision maker under uncertainty, that is, its behavior is consistent with the von

Neumann-Morgenstern axioms. A budget-constrained funding model which characterizes potential project commercial interdependencies and consider the risk/time preferences of the firm in a multiperiod framework. Several modifications which improve the model's realism are discussed. An approach for incorporating projects' technical interdependencies within the model is shown. The time-table of projects' availabilities and deadlines can also be included so that the current outlay plan reflects the timing of future research. Dissert. Abstr.

N79-16708 Texas A&M Univ., College Station.
IMPLEMENTING A NEW STATISTICAL APPROACH TO PROJECT SCHEDULING Ph.D. Thesis
Thomas Cecil Baker, Jr. 1978 93 p
Avail: Univ. Microfilms Order No. 7900949

The project scheduling algorithm is a five step iterative procedure capable of determining a minimum cost project schedule when the activities making up the project have durations which are random variables. The cost of an activity is assumed to be a convex piecewise linear function of the activity's mean duration. The problem is to determine the activity mean durations which both minimize the total project cost and insure that the mean (or some specified percentile) of the corresponding project completion time distribution is less than or equal to a specified project deadline. The entire distribution of the project's completion time under the minimum cost schedule is a valuable by-product. Dissert. Abstr.

N79-16709*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A CRITICAL REVIEW OF THE LIFE SCIENCES PROJECT MANAGEMENT AT AMES RESEARCH CENTER FOR THE SPACELAB MISSION DEVELOPMENT TEST 3
Robert Helmreich (Texas Univ., Austin), John Wilhelm (Texas Univ., Austin), Trieve A. Tanner (California State Univ., Hayward), Joan E. Sieber (Texas Univ., Austin), and Susan Burgenbauch Jan. 1979 66 p refs
(Grant NsG-2065; NCA2-OR290-705)
(NASA-TP-1364; A-7536) Avail: NTIS HC A04/MF A01 CSCL 05A

A management study was initiated by ARC (Ames Research Center) to specify Spacelab Mission Development Test 3 activities and problems. This report documents the problems encountered and provides conclusions and recommendations to project management for current and future ARC life sciences projects. An executive summary of the conclusions and recommendations is provided. The report also addresses broader issues relevant to the conduct of future scientific missions under the constraints imposed by the space environment. G.Y.

N79-16710# Royal Naval Personnel Research Committee, London (England).
[SYNOPSIS OF THE ROLE OF THE RNPRC AND ITS ACTIVITIES COVERING THE PERIOD JANUARY 1975 TO DECEMBER 1976]
Dec. 1976 22 p
(RNP-1/77; BR61590) Avail: NTIS HC A02/MF A01

Investigations undertaken by the Royal Naval Research Committee to solve biological, medical, physiological, and psychological problems affecting the health and fighting efficiency of British naval personnel are reported. Areas studied included protective clothing for cold environments; deafness in divers; noise dosage of aircrews; the effects of carbon monoxide, carbon dioxide, and watchkeeping on submarine crews; survival at sea; physical fitness and operational efficiency under stresses; and underwater physiology. A list of published reports and related articles in scientific journals is included. A.R.H.

N79-16711# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
[RESEARCH ACTIVITIES] Annual Report, 1977
18 May 1978 207 p refs Original contains color illustrations
Avail: NTIS HC A10/MF A01

The history of the French national institute for aerospace research and studies (ONERA) is reviewed as well as its organizational structure and mission. Progress is reported in the application of mathematical methods to the study of systems in aerospace mechanics. Other areas of research discussed include fundamental and applied aerodynamics; aeroelasticity and fracture mechanics in structural analysis; compressors, turbines, solid and liquid propellant combustion, and ramjets; acoustics, optics, and electronics; solidified eutectics, heat resistant alloys, composite materials, and thermomechanical treatments; informatics; and special activities at the Toulouse Research Center (CERT). Patents filed and films completed in 1977 are described. Abstracts of published articles and technical notes are included along with the texts of news releases. A.R.H.

N79-16712# American Automatic Control Council, Wickliffe, Ohio.
RESEARCH NEEDS OF THE AUTOMATION FIELD
Samuel J. Dwyer, III and Theodore J. Williams Oct. 1977 256 p refs
(Grant NSF APR-76-01002)
(PB-286853/7; NSF/RA-770648) Avail: NTIS HC A12/MF A01 CSCL 05A

The Automation Research Council is in the process of expanding its list of recommendations, in both content and detail, concerning the research needs of the automation field for the next 20 years. Research, as outlined by the Council, is particularly needed in systems design and systems engineering. The following areas are discussed fully in this report; basic manufacturing systems architectures; data base design and operation; software-hardware interfaces between machines and between men and machines; fault tolerant, self repair, and self-diagnostic techniques; machine vision; and smart sensors. Recommendations are given for work to be done on the socio-economic and socio-technical aspects of the field, and on improving the educational institution's response to the needs of industry for trained personnel. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N79-16713 North Carolina Univ. at Chapel Hill.
A CONCEPT-VECTOR REPRESENTATION OF THE PARAGRAPHS IN A DOCUMENT, APPLIED TO AUTOMATIC EXTRACTING Ph.D. Thesis
John Wise McInroy 1978 127 p
Avail: Univ. Microfilms Order No. 7900480

A new method of automatic extracting is detailed, which uses concept vectors, along with a procedure for evaluating extracts, and results of experiments in which the evaluation procedures used to compare extracts employing the concept-vector method with human-produced abstracts and with other automatically produced extracts. Concept-vector extracts performed better in information-retrieval tests in the SMART system than a competing automatic method, but these differences were not statistically significant. Concept-vector extracts do not perform so well as human-produced abstracts, but do perform better than extracts taken at random from documents. These differences are significant according to some of the statistical tests used. Dissert. Abstr.

N79-16714 City Univ., London (England).
THE USE OF SURROGATE INFORMATION FOR INDEXING REPORT LITERATURE M.S. Thesis
John Roger Kirby (Defence Res. Inform. Centre) Sep. 1977 454 p refs
(BR59116) HC A20

A method for measuring the information contents of titles and abstracts is described, and applied to citations in Defense Research Abstracts a typical reports oriented abstracts bulletin. These measurements are used to make a quantitative comparison of the applicability to automatic indexing of five surrogates/modifications/combinations based on report titles and indicative abstracts. An examination is also made of the dependence of a manual indexer (as opposed to an automated process) on the

title and abstract for descriptor words, and the variation of this dependence with changes of subject (and, hence, of background knowledge). A literature review of the important factors involved in these aspects of indexing both automatic and manual, is included. G.Y.

N79-16715# National Bureau of Standards, Washington, D. C. National Engineering Lab.
DIMENSIONS/NBS. VOLUME 62, NUMBER 9, SEPTEMBER 1978 Monthly Report
Sep. 1978 36 p
(PB-287208/3; NBS-DIM-62-9) Avail: NTIS HC A03/MF A01 CSCL 05B

The monthly magazine features short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications. The table of contents for the current issue is: (1) corrosion facts for the consumer; (2) insulation insomnia--a cure; (3) the National Measurement System; (4) nuclear safeguards and NBS; (5) new measurement concept for the electronics industry; (6) program on migration behavior of plastic food-packaging materials; (7) toward a new scale of temperature; (8) new steel standard reference material; and (9) standard reference material for metals industry. GRA

N79-16794# Joint Publications Research Service, Arlington, Va.
BASIC DIRECTIONS IN RESEARCH ON THE PROBLEMS OF SCIENTIFIC MEDICAL INFORMATION
Yu. A. Shilinis *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 55 (JPRS-72716) 29 Jan. 1979 p 41-48 Transl. into ENGLISH from Sov. Zdravookhr. (Moscow), no. 12, 1978 p 25-30 (For primary document see N79-16792 07-99)
Copyright. Avail: NTIS HC A02/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N79-16716# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliquee.
ECONOMIC USEFULNESS OF ESA CONTRACTS. VOLUME 2: MAIN REPORT [L'UTILITE ECONOMIQUE DES CONTRATS DE L'ESA. VOLUME 2: RAPPORT PRINCIPAL]
Patrick Cohendet, Regis LaruedeTournemine, and Helwig Schmied Paris ESA Jul. 1978 77 p In FRENCH 3 Vol.
(Contract ESA-2905/76-F-WMT(SC))
(ESA-CR(P)-1121-Vol-2) Avail: NTIS HC A05/MF A01

Fundamental theories and methods used in quantifying the economic consequences of the European Space Agency's (ESA) budget are described with emphasis on indirect cost benefits realized by contractors to that agency. The usefulness of ESA contracts is assessed from the viewpoint of technical advantages, commercial advantages, improvement in management methods and efficiency, and advantages in production factors involving both personnel development and better equipment. One hundred seventy-one cases of usefulness were quantified during 77 contractors visits. In addition, approximately 80 types of advantages which are impossible to quantify were identified. Transl. by A.R.H.

N79-16717# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliquee.
ECONOMIC USEFULNESS OF ESA CONTRACTS. VOLUME 3: THEORETICAL REPORT [L'UTILITE ECONOMIQUE DES CONTRATS DE L'ESA. VOLUME 3: REPORT THEORIQUE]
Patrick Cohendet, Regis LaruedeTournemine, and Helwig Schmied Paris ESA Jul. 1978 34 refs In FRENCH 3 Vol.
(Contract ESA-2905/76-F-WMT(SC))
(ESA-CR(P)-1121-Vol-3) Avail: NTIS HC A03/MF A01

A macroeconomic model describing the relationship between research and development and economic growth is discussed and applied to the effects produced in the United States by NASA expenditures. Attempts to use microeconomic models to measure the spinoff from space research in both the United States and in the Federal Republic of Germany are reviewed. Methods used to measure the economic advantages created by ESA for its contractors and member nations are examined and the results are analyzed. Transl. by A.R.H.

N79-16718# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliquee.
ECONOMIC USEFULNESS OF ESA CONTRACTS. VOLUME 4: METHODOLOGY OF SAMPLING [L'UTILITE ECONOMIQUE DES CONTRATS DE L'ESA. VOLUME 4: RAPPORT METHODOLOGIQUE SUR L'ECHANTILLON]
Patrick Cohendet, Regis LaruedeTournemine, and Helwig Schmied Paris ESA Jul. 1978 15 p In FRENCH 3 Vol.
(Contract ESA-2905/76-F-WMT(SC))
(ESA-CR(P)-1121-Vol-4) Avail: NTIS HC A02/MF A01

The nations represented in a survey of benefits derived from ESA contracts are listed as well as the criteria for the selection of individual contractors. Transl. by A.R.H.

N79-16719# Environmental Measurements, Inc., Annapolis, Md.
EVALUATION OF ECONOMIC BENEFITS OF RESOURCE CONSERVATION Final Report
Robert C. Anderson Sep. 1978 51 p refs
(Grant EPA-R-803880)
(PB-286973/3; EPA-600/5-78-015) Avail: NTIS HC A04/MF A01 CSCL 05C

The forces that determine prices of non-renewable natural resources are an important consideration in an evaluation of the social desirability of conservation through recycling. If prevailing market prices accord conservation benefits a value less than their true value to society, the prices are suboptimal and the solution may require governmental support of resource recovery and recycling. A comprehensive review of the literature on natural resource economics reveals that numerous external forces can cause divergencies between the socially optimal prices and the prices that are actually determined in the market place. The forces act in varying directions and with varying intensities over time. It is difficult to establish with any degree of precision the magnitude or even the direction of bias given to the prices acting on supply and demand. The socially optimal level of resource conservation is likely to be viewed differently by individuals of different generations. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N79-16720 California Univ., Los Angeles.
RISK ASSESSMENT OF HEAVY METALS AND TRACE ORGANICS IN MUNICIPAL SLUDGE MANAGEMENT: A CASE STUDY OF THE REGIONAL WASTEWATER SOLIDS MANAGEMENT PROGRAM LOS ANGELES AND ORANGE COUNTY METROPOLITAN AREA OF CALIFORNIA (LA/OMA PROJECT) Ph.D. Thesis

Mingin Philip Lo 1978 183 p
Avail: Univ. Microfilms Order No. 7901377

Disposition of sludge in the land, air and ocean environment of Southern California involves a degree of risk of adverse effect to human health and the environment. Preliminary assessment of the risk to public health and the environment was made, both in putting the risk into perspective and in delineating the necessary tradeoff between the three compartments of the environment for the utimate disposition of sludge and its toxicants. Hazards from the present system of marine disposal of sludge, atmospheric disposition of sludge through sludge pyrolysis, land utilization of sludge for agriculture and also for home-and-garden use, and landfill disposal are evaluated. Both the magnitude of the risk and the willingness of the public to risk for a certain alternative would determine the socially acceptable choice for sludge disposition. A trade-off between the land, air and marine environment for sludge toxicant disposition is essential.

Dissert. Abstr.

N79-16721*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INITIAL COMPARISON OF SINGLE CYLINDER STIRLING ENGINE COMPUTER MODEL PREDICTIONS WITH TEST RESULTS

Roy C. Tew, Jr., Lanny G. Thieme, and David Miao 1979 37 p refs Presented at the Intern. Congr. and Exposition, Detroit, 26 Feb. 1979 - 4 Mar. 1979; sponsored by the Soc. of Automotive Engr.
(Contract EC-77-A-31-1040)
(NASA-TM-79044; DOE/NASA/1040-78/30; E-9848) Avail: NTIS HC A03/MF A01 CSCL 10B

A Stirling engine digital computer model developed at NASA Lewis Research Center was configured to predict the performance of the GPU-3 single-cylinder rhombic drive engine. Revisions to the basic equations and assumptions are discussed. Model predictions with the early results of the Lewis Research Center GPU-3 tests are compared. A.R.H.

N79-16722# Minnesota Univ., Minneapolis. Hubert H. Humphrey Inst. of Public Affairs.

DESIGN OF STATE, REGIONAL AND LOCAL DEVELOPMENT MANAGEMENT SYSTEMS, VOLUME 1

Robert C. Einsweiler, Robert H. Freilich, Michael E. Gleeson, and Martin Leitner Mar. 1978 392 p
(Grant NSF ENV-76-06857)
(PB-287324/8; NSF/RA-780285-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 13B

Volume 1 of the study developed information on four critical gaps in development management systems: (1) statement of an enlarged concept of development management systems that could encompass efforts in growth and decline settings at all governmental levels; (2) identification of Federal and state government constraints on lower level governments; (3) identification of considerations in the selection of a system and techniques; and (4) decisions on how to monitor a system. The study addresses the ways of thinking about development management that are useful for design and policy making. The term development management is used to encompass the conscious public decision to restrain, accommodate or induce development in any geographic setting and at any governmental level. GRA

N79-16723# Minnesota Univ., Minneapolis. Hubert H. Humphrey Inst. of Public Affairs.

DESIGN OF STATE, REGIONAL AND LOCAL DEVELOPMENT MANAGEMENT SYSTEMS, VOLUME 2

Robert C. Einsweiler, Robert H. Freilich, Michael E. Gleeson, and Martin Leitner Mar. 1978 345 p
(Grant NSF ENV-76-06857)
(PB-287325/5; NSF/RA-780286-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 13B

The study reviews the types of development management systems which were implemented in the cities treated as case studies in order to gain insight into the system gaps identified in Volume One and to apply ideas generated in the case studies. The earliest development management systems allocated land for development. An area of urbanization or an urban service area was established, bounded by an urban limit line. This approach is frequently the choice of counties or metropolitan agencies lacking direct land use or capital programming control. The next step in management, the support systems or budget approach, centered on the capital improvement program, addressing timing directly. The squeeze on public budgets was an additional factor in this choice. Another development management system aims to control the amount or rate of growth by housing unit allocation. A final type of management system, the activity allocation approach, is one that allocates activity, land and support services. GRA

N79-16724# National Technical Information Service, Springfield, Va.

TECHNOLOGY TRANSFER: GENERAL THEORETICAL STUDIES, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1972 - 1976

Mary E. Young Dec. 1978 212 p
(NTIS/PS-78/1273/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

The cited reports cover research in technology transfer from 1972 through 1976. Included are topics on Government policies, aid to developing countries, feasibility studies, proposed methodologies, and theory. Specific applications and single-topic technological utilization reports are excluded. This updated bibliography contains 205 abstracts, none of which is new entries to the previous edition. GRA

N79-16725# National Technical Information Service, Springfield, Va.

TECHNOLOGY TRANSFER: GENERAL AND THEORETICAL STUDIES, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Dec. 1978

Mary E. Young Dec. 1978 130 p Supersedes NTIS/PS-77/1131; NTIS/PS-76/1008; NTIS/PS-75/884; COM-74-11194 (NTIS/PS-78/1274/6; NTIS/PS-77/1131; NTIS/PS-76/1008; NTIS/PS-75/884; COM-74-11194) Avail: NTIS HC $28.00/MF $28.00 CSCL 05B

Policies and management methods used for technology transfer are covered in reports cited in this bibliography which contains 123 abstracts, of which 59 are new to the previous edition. GRA

N79-16726# Environmental Protection Agency, Washington, D. C. Municipal Construction Div.

UPGRADING TRICKLING FILTERS

Jun. 1978 139 p refs
(PB-286920/4; EPA-MCD-42; EPA-430/9-78-004) Avail: NTIS HC A07/MF A01 CSCL 13K

Trickling filters offer advantages of lower energy needs and relative ease of operation. This report presents operating results from more than 100 existing trickling filter treatment plants and makes some general observations concerning the overall successful performance of these systems. It indicates that, when properly designed, constructed and operated, trickling filters are an alternative which is worthy of further consideration in meeting the discharge requirements of the law. The basic thrust of the report is that trickling filters, often in combination with other treatment techniques, should be considered for new facilities as well as for continued use in plants where they presently exist. GRA

N79-16727# Federal-State Land Use Planning Commission for Alaska, Anchorage.

THE URBAN FRINGE: METHODS OF LAND USE DIRECTION

Janet McCabe May 1978 35 p refs
(PB-287289/3; FSLUPCA-35) Avail: NTIS HC A03/MF A01 CSCL 13B

The report is one of a series of studies that discusses base land planning and policy recommendations in Alaska, including discussion of balance between private and public land and discussion of acquisition and transfer of development rights. GRA

N79-16728# C&G Engineering, Inc., Salem, Oreg.

PRESSURE AND VACUUM SEWER DEMONSTRATION PROJECT, BEND, OREGON Final Report, Jul. 1974 - Jul. 1977

Jessie E. Eblen and Lloyd K. Clark Sep. 1978 124 p refs

(Grant EPA-S-803295)
(PB-287146/5; EPA-600/2-78-166) Avail: NTIS HC A06/MF A01 CSCL 13B

A pressure sewer system collecting domestic septic tank effluent and a vacuum system collecting raw domestic sewage were constructed in the City of Bend, Oregon. Each of the systems collected sewage from eleven houses and discharged into existing gravity sewer mains. Groups of one, two and three houses were served by single collection sump/vacuum valve or collection sump/pump combinations. The systems were operated and monitored for a period of approximately one year. The systems were evaluated for construction costs, operation and maintenance costs, reliability, operating characteristics, and chemical characteristics of collected sewage and septic effluent. GRA

N79-16729# Delaware Univ., Newark. Dept. of Chemical Engineering.
CONTROL OF ACTIVATED SLUDGE TREATMENT Project Completion Report, 1 Jan. 1975 - 30 Sep. 1977
Morton M. Denn Oct. 1977 20 p refs
(Contract DI-14-34-0001-7016)
(PB-287068/1; W78-12117; OWRT-A-033-DEL(1)) Avail: NTIS HC A02/MF A01 CSCL 13B

A dynamic simulation model was developed to account for the possible regions of continuous concentration variation during the activated sludge process. Simulations show that the dynamics of the process are governed under certain conditions by interactions between the reactor and the settler through sludge recycle. Ratio control on both sludge recycle and settler underflow is recommended. This control policy does not require sludge storage. GRA

N79-16730# North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
REGIONALIZATION OF WASTEWATER COLLECTION AND TREATMENT LOCATION, SCALE AND CONSTRUCTION SEQUENCE OF SYSTEM COMPONENTS Final Report
Donald T. Lauria 1978 76 p refs
(Grant NSF ENV-76-01135)
(PB-287092/1; NSF/RA-780248) Avail: NTIS HC A05/MF A01 CSCL 13B

A mixed integer programming model was developed for the analysis of alternatives concerning extensive regional wastewater planning. Application to a typical problem in Pennsylvania involved about 1000 variables and 1000 constraints. The model was found to be difficult and expensive to solve, requiring extensive expertise in mathematical programming. Work was done to take account of such things as treatment process upgrading, useful economic life of existing facilities, salvage values, inflation, O and M, and replacement costs. In order to shorten problem set up time, a matrix generation program was written that reduces the input data deck for a typical problem from 3000 to 300 cards. The solution strategy employed relies on linear instead of mixed integer programming. GRA

N79-16731# Los Angeles County Sanitation District, Whittier, Calif.
WASTEWATER DEMINERALIZATION BY TUBULAR REVERSE OSMOSIS PROCESS Final Report, Jan. 1970 - Jun. 1971
Ching-lin Chen and Robert P. Miele Sep. 1978 78 p refs Sponsored by EPA
(PB-287117/6; EPA-600/2-78-167) Avail: NTIS HC A05/MF A01 CSCL 13B

A 16 1pm (4.2 gpm) tubular reverse osmosis pilot plant was operated at Pomona Advanced Wastewater Treatment Research Facility for over one year. The purpose of the study was to investigate the applicability of the tubular reverse osmosis process to wastewater demineralization. The pilot plant operational goal was the study of the membrane life. The feed was carbon-treated secondary effluent. This study lasted until the operating membrane modules reduced from the original 32 modules to 12 modules. It was decided to make use of the remaining 12 modules for exploring the behavior of the membrane process in treating primary effluent. Repeated membrane failure resulting from poor mechanical design of the system obviated drawing significant conclusions. GRA

N79-16732# Municipal Environmental Research Lab., Cincinnati, Ohio. Wastewater Research Div.
BREAKPOINT CHLORINATION/ACTIVATED CARBON TREATMENT: EFFECT ON VOLATILE HALOGENATED ORGANICS
James J. Westrick, Michael D. Cummins, and Jesse M. Cohen Sep. 1978 88 p refs
(PB-287129/1; EPA-600/2-78-165) Avail: NTIS HC A05/MF A01 CSCL 13B

The production and removal of six volatile halogenated organic compounds during treatment of tertiary clarified and filtered wastewater by breakpoint chlorination and activated carbon was examined in a continuous flow pilot plant. Short contact time breakpoint chlorination of filter effluent increased chloroform and bromodichloromethane concentrations by 50 micrograms/liter and 10 micrograms/liter, respectively. Treatment by carbon prior to chlorination reduced the formation of chloroform by a factor of four, but was less effective in reducing the amount of bromoform produced. A 20 minute empty bed contact time activated carbon adsorber was much more efficient for chloroform removal than a 10 minute adsorber. GRA

N79-16733# General Accounting Office, Washington, D. C. Community and Economic Development Div.
TRANSPORTATION ISSUES
10 Oct. 1978 76 p refs
(PB-287194/5; CED-78-159) Avail: NTIS HC A05/MF A01 CSCL 13B

The Federal Government spends over $18 billion a year on transportation programs. These programs affect every part of the transportation system including aviation, highways, inland waterways, intercity buses, motor vehicles, ocean shipping, pipelines, rail freight service, rail passenger service, trucking and urban mass transit. This study examines current and emerging issues relating to Federal involvement in transportation. It emphasizes congressional interests and potential congressional needs for GAO assistance. GRA

N79-16734# Denver Research Inst., Colo.
THE COLLEGE OF TROPICAL AGRICULTURE AT THE UNIVERSITY OF HAWAII: A CASE STUDY IN THE U.S. APPLICATION OF SCIENCE AND TECHNOLOGY TO DEVELOPMENT IN DEVELOPING COUNTRIES Final Report, Sep. 1977 - Feb. 1978
Theodore W. Schlie, Laurie N. Adler, and Melinda Cain Jun. 1978 66 p
(Contract NSF C-SRS-77-27991)
(PB-287132/5) Avail: NTIS HC A04/MF A01 CSCL 05A

The purpose of this study is: (1) to illustrate and gain insight into the development and evolution of Less Developed Countries-oriented, scientific and technological activities at the College of Tropical Agriculture, University of Hawaii; (2) to discuss their problems and future outlook; and (3) to attempt to learn from their experience in seeing how the United States can practically assist in applying science and technology to development in developing countries. GRA

N79-16735# Denver Research Inst., Colo.
THE QUALIFICATION OF UNITED STATES' SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES ORIENTED TOWARD THE DEVELOPING COUNTRIES: A FEASIBILITY STUDY Final Report
Theodore W. Schlie, Laurie N. Adler, and Melinda Cain Jul. 1978 207 p refs
(Contract NSF C-SRS-77-27991)
(PB-287133/3) Avail: NTIS HC A10/MF A01 CSCL 05A

The purpose of the study was primarily to test the feasibility of developing an operational methodology for the generation of quantitative estimates and descriptions of U.S. expenditures for scientific and technological (S/T) activities which are performed in Less Developed Countries (LDC) or performed in the United States but intended for or relevant to application in LDC's, and also to begin the collection of these data to present them in a form that could be utilized in the preparation of the U.S. country paper for the United Nations Conference on Science and Technology for Development. GRA

N79-16736# Dayton Univ. Research Inst., Ohio. Research Inst.
INVESTIGATION OF ADVANCED THERMAL-CHEMICAL CONCEPTS FOR OBTAINING IMPROVED MSW-DERIVED PRODUCTS Final Report
N. L. Hecht, D. S. Duvall, and B. L. Fox Aug. 1978 119 p refs
(Grant EPA-R-804421-01)
(PB-286936/0; EPA-600/7-78-143) Avail: NTIS HC A06/MF A01 CSCL 21D

Although a number of resource recovery from refuse programs have been effective, the quality of the products recovered could be enhanced to improve their marketability. The purpose of this study was to investigate the potential of known processes that could improve the quality of the fuels or other products derived from the organic fraction in refuse. Possible processes for improving the quality of products from the organic fraction derived from municipal solid waste (MSW) were determined, and descriptions were developed for each process. An analytical framework for technical and economic assessment was developed to serve as a guide for analysis. Major thermal and chemical processes used in the pulp and paper, wood, textile, and resource recovery industries were identified. This study concentrated on those processes designed to produce a carbon char, a powdered fuel, and liquid and gaseous fuels from the municipal solid waste. GRA

N79-16737# JHK and Associates, Alexandria, Va.
APPLICATION OF UTCS FIRST GENERATION CONTROL SOFTWARE IN NEW ORLEANS Final Report
R. D. Henry, R. A. Ferlis, and R. M. White Jan. 1978 98 p refs Prepared jointly with Peat, Marwick, Mitchell and Co., Washington, D. C. 2 Vol.
(Contract DOT-FH-11-9286)
(PB-287360/2; FHWA-RD-78-3) Avail: NTIS HC A05/MF A01 CSCL 13B

An evaluation of the recently installed computer-based traffic signal control system in New Orleans, Louisiana is detailed. The evaluation effort focused on two primary areas: on-street measures of performance, (e.g., is traffic moving more efficiently with the new system than with the old) and, system operations measures of performance, (e.g., do the real-time surveillance, equipment monitoring, and control capabilities result in tangible improvements when compared to that which could be achieved with a conventional system). Emphasis in the study is also placed on the application of UTCS first generation software to control traffic on arterial roadways. The results show that the two computer based alternatives that were evaluated provided significant improvements in performance with respect to the base case. GRA

N79-16738# JHK and Associates, Alexandria, Va.
APPLICATION OF UTCS FIRST GENERATION CONTROL SOFTWARE IN NEW ORLEANS
R. D. Henry, R. A. Ferlis, and R. M. White Nov. 1978 37 p Prepared jointly with Peat, Marwick, Mitchell and Co., Washington, D. C. 2 Vol.
(Contract DOT-FH-11-9286)
(PB-287359/4; FHWA-RD-78-2) Avail: NTIS HC A09/MF A01 CSCL 13B

An evaluation summary of the recently installed computer based traffic signal control system in New Orleans, Louisiana is presented. Emphasis was placed on the application of UTCS first generation software to control traffic on arterial roadways. The results showed that a time-of-day alternative resulted in an average of 8.8 percent reduction in total vehicle-minutes of network travel during the 14-hour testing period. A traffic responsive alternative provided an 8.5 percent reduction. GRA

N79-16739# SCS Engineers, Long Beach, Calif.
LAND CULTIVATION OF INDUSTRIAL WASTES AND MUNICIPAL SOLID WASTES. STATE-OF-THE-ART STUDY. VOLUME 1: TECHNICAL SUMMARY AND LITERATURE REVIEW Final Report, Jul. 1976 - Jan. 1978
Tan Phung, Larry Barker, David Ross, and David Bauer Aug. 1978 220 p refs 2 Vol.
(Contract EPA-68-03-2435)
(PB-287080/6; EPA-600/2-78-140A-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 13B

A review of the available literature on land cultivation of industrial wastewater and sludge, and municipal solid waste was conducted. Depending on waste characteristics, the disposal program can be either related to agriculture or solely a disposal practice. This technical summary contains information about land cultivation practices, waste characteristics and quantities, mechanisms of waste degradation, effects on soil properties and plants, regulations, site selection, operation, environmental impact assessment, site monitoring, site conceptual design, and case study summaries. GRA

N79-16740# SCS Engineers, Long Beach, Calif.
LAND CULTIVATION OF INDUSTRIAL WASTES AND MUNICIPAL SOLID WASTES. STATE-OF-THE-ART STUDY. VOLUME 2: FIELD INVESTIGATIONS AND CASE STUDIES Final Report, Jul. 1976 - Jan. 1978
Tan Phung, Larry Barker, David Ross, and David Bauer Aug. 1978 173 p refs 2 Vol.
(Contract EPA-68-03-2435)
(PB-287081/4; EPA-600/2-78-140B-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 13B

Field investigations at ten land cultivation sites are discussed. These ten sites represent a variety of waste and site characteristics, climate, and waste application techniques. Analytical results are presented along with brief narrative site descriptions. Operating cost information was also collected from each site. Nonstandard disposal or waste utilization techniques for hazardous wastes are discussed. GRA

N79-16741# System Design Concepts, Inc., Washington, D. C.
OPERATING MULTI-MODAL URBAN TRANSPORTATION SYSTEMS Final Report
Michael Petersilia and Arlee Reno Dec. 1977 218 p
(Contract DOT-OS-60518)
(PB-287294/3; DOT-P-10-78-41) Avail: NTIS HC A10/MF A01 CSCL 13B

The project examines: (1) the state-of-the-art in multi-modal urban transportation system operations; (2) proposes and assesses eight model institutional arrangements for more efficient and effective urban transportation operations; (3) assesses the influence of Federal policies in this area; and (4) proposes possible changes to enhance coordination of urban transportation services. The report concludes that some of the more important elements determining the success of efforts to coordinate urban transportation operations are: (1) institutional structure; (2) responsibility for coordination; (3) incentives operating on each agency and individual; (4) patterns of personal relationships; and (5) specific mechanisms for coordination. Potential Federal actions and incentives for promoting coordinated urban transportation operations are proposed. GRA

N79-16742# Dayton Univ. Research Inst., Ohio. Research Inst.
PREDICTING THE DIFFUSION RATE OF INDUSTRIAL INNOVATIONS Final Report
Joseph P. Martino, Kuei-Lin Chen, and Ralph C. Lenz, Jr. Mar. 1978 282 p refs
(Grant NSF PRA-76-17188)
(PB-286693/7; UDRI-TR-78-42) Avail: NTIS HC A13/MF A01 CSCL 05A

The diffusion of over 40 innovations in 14 industries was studied to develop a predictive model for the rate of diffusion of innovations. The literature on diffusion of innovations was reviewed, and generalizations advanced in that literature were used as the basis for hypotheses about factors which influence the rate of diffusion of industrial innovations. Each of the hypotheses was then operationalized by selecting quantitative variables which served as measures of the hypothesized factors. Two regression models were developed, one with and one without P and D expenditures. Each of the resulting models, using only variables for which data could be available at the time of the introduction of an innovation or early in its diffusion history, explained about 50% of the variance of the diffusion rates. GRA

N79-16743# Wisconsin Univ., Madison. Law School.
LAND APPLICATION OF WATERWASTE AND STATE WATER LAW: STATE ANALYSES, VOLUME 2

Final Report
Donald W. Large Aug. 1978 199 p refs Prepared in cooperation with Economics, Statistics and Cooperatives Service, Washington, D. C.
(Contract EPA-IAG-D5-0799)
(PB-286975/8; EPA-600/2-78-175) Avail: NTIS HC A09/MF A01 CSCL 05D

State water rights law in order to determine its possible impact on systems of land application of wastewater was examined. It was determined that most states do not have regulations specifically controlling land application of wastewater, and that an analysis would have to be undertaken of basic state water law principles which, for the most part, were developed with entirely different uses of water in mind. State water rights law was found to contain enough flexibility, through its emphasis on encouraging 'reasonable' uses of water, to enable land application systems to operate free from legal uncertainty. GRA

88 SPACE SCIENCES (GENERAL)

N79-16744# Consiglio Nazionale delle Ricerche, Rome (Italy). Committee for Space Research.
SPACE RESEARCH ACTIVITY IN ITALY
A. M. Sheggi 1977 23 p refs Presented at the 20th COSPAR Plenary Meeting, Tel Aviv, Israel, 7-18 Jun. 1977
Avail: NTIS HC A02/MF A01

Research reports from the institutes in Italy involved in space research are presented. Space research in Italy is programmed by the Committee for Space Research, and advisory body of the National Research Council. ESA

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-16745 Case Western Reserve Univ., Cleveland, Ohio.
SPECTRAL CLASSIFICATION OF HIGH-PROPER-MOTION STARS Ph.D. Thesis
Sang-Gak Le 1978 161 p
Avail: Univ. Microfilms Order No. 7901527

Spectral types were found for as many as possible of the approximately 9000 stars of high proper motion contained in recent Northern Hemisphere proper-motion-star survey. Types for more than two thousand of these stars are already available in the literature, but new determinations have been made for about 900 stars, mainly previously unclassified objects, from objective-prism plates already existing or specially obtained with a Burrell Schmidt. Classifications of about 80 stars of large tangential velocity were also done utilizing slit spectrograms taken with the 36-inch reflector. In addition to simply providing new spectra data for a large number of high-proper-motion stars, a new calibration of Luyten's H was obtained. Dissert. Abstr.

N79-16746 Arizona Univ., Tucson.
AN ASTROPHYSICAL STUDY OF THE MINOR PLANETS IN THE EOS AND KORONIS ASTEROID FAMILIES Ph.D. Thesis
Jonathan Carey Gradie 1978 167 p
Avail: Univ. Microfilms Order No. 7901721

A survey of the physical properties was carried out using photoelectric photometry in the UBV system and thermal radiometry at a wavelength of ten microns. Colors were obtained for thirty-eight Eos and sixteen Koronis members and albedos and diameters were obtained for twenty Eos and eight Koronis members. The classification of family members into the major compositional types defined for the brighter asteroids demonstrates that both families are dominated by S-type objects and are quite distinct from the C-type asteroids dominant in the vicinity. Compositional variations among members of the Eos family may reflect inhomogeneities in the parent body. The minimum diameter of this parent body was approximately 180 kilometers. The Koronis family shows little compositional diversity and the parent body appears to have been a typical S-type asteroid at least 90 kilometers in diameter.
Dissert. Abstr.

N79-16747 Texas Univ. at Austin.
SPECTROSCOPIC OBSERVATIONS OF NOVA V1500 CYGNI (1975) Ph.D. Thesis
Gary Joseph Ferland 1978 332 p
Avail: Univ. Microfilms Order No. 7900558

Scanner data covering V1500 Cygni's first year of outburst are reduced and interpreted. The interstellar reddening of the nova was measured with a variety of techniques, and the distance inferred from the distance-reddening law in the direction of the nova. It is shown that the Balmer emission lines were optically thick during the early nebular phase, and derive a cosmic helium abundance after correcting for this effect. The heavy element composition of the ejecta is measured with the nebular emission lines during the phases of the outburst, and large overabundances of carbon, nitrogen, oxygen, and neon found. Dissert. Abstr.

N79-16748*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HIGH-ENERGY PULSED X-RAY SPECTRUM OF HER X-1 AS OBSERVED WITH OSO-8 Ph.D. Thesis - Catholic Univ. of America
G. S. Maurer, B. R. Dennis, M. J. Coe, C. J. Crannell, E. P. Cutler (Comtech. Lanham, Md.), J. F. Dolan, K. J. Frost, and L. E. Orwig Dec. 1978 30 p refs Submitted for publication
(Grant NsG-5066)
(NASA-TM-79692) Avail: NTIS HC A03/MF A01 CSCL 03A

Her X-1 was observed from 1977 August 30 to September 10 using the High-Energy X-Ray Scintillation Spectrometer on board the OSO-8 satellite. The observation, during which the source was monitored continually for nearly an entire ON-state, covered the energy range from 16 to 280 keV. Pulsed flux measurements as a function of binary orbit and binary phase are presented for energies between 16 and 98 keV. The pulsed flux between 16 and 33 keV exhibited a sharp decrease following the fourth binary orbit and was consistent with zero pulsed flux thereafter. The pulsed spectrum was fitted with a power law, a thermal spectrum without features, and a thermal spectrum with a superposed gaussian centered at 55 keV. The latter fit has the smallest value of chi - squared per degree of freedom, and the resulting integrated line intensity is 1.5 superscript + 4.1 subscript - 1.4 x .001 photons s superscript-1 cm superscript-2 for a width of 3.1 superscript + 9.1 subscript -2.6 keV. This result, while of low statistical significance, agrees with the value observed by Trumper (1978) during the same On-state.
Author

N79-16749*# Hale Observatories, Pasadena, Calif.
TWO-MICRON SPECTROPHOTOMETRY OF THE GALAXY NGC 253
C. G. Wynn-Williams (Mullard Radio Astronomy Observatory, Cambridge, England), E. E. Becklin, K. Matthews, and G. Neugebauer [1979] 16 p refs
(Grants NGL-05-002-207; NSF AST-77-20516)
(NASA-CR-158013) Avail: NTIS HC A02/MF A01 CSCL 03A

A very strong Brackett-gamma hydrogen emission line, and the 2.3 micron CO stellar absorption feature were measured in NGC 253. The presence and strength of the CO feature indicates that late type giant stars produce most of the 2.2 micron continuum emission, while the rate of ionization implied by strength of the Brackett-gamma line indicates that much, perhaps all, of the luminosity detected at far infrared wavelengths originates from a large number of OB stars. As compared to the corresponding region of the Galaxy, the number of massive young stars in the central 200 pc of NGC 253 is thirty times greater, but the total mass of stars is roughly the same. F.O.S.

N79-16750*# California Univ., Berkeley. Dept. of Physics.
THE BRIGHTNESS DISTRIBUTION OF IRC +10216 AT 11 MICRONS
E. C. Sutton, A. L. Betz, J. W. V. Storey, and D. L. Spears (Lincoln Lab., MIT, Lexington) 1979 15 p refs

(Grants NGL-05-003-272; NSF AST-77-12256)
(NASA-CR-157646) Avail: NTIS HC A02/MF A01 CSCL 03A

The brightness distribution of IRC +10216 at a wavelength of 11 microns was measured in detail using a spatial interferometer. This brightness distribution appears to have azimuthal symmetry; an upper limit of 1.1 may be set to the ellipticity at 11 microns if the object has a major axis oriented either along or perpendicular to the major axis of the optical image. The radial distribution shows both compact and extended emission. The extended component, which is due to thermal emission from circumstellar dust, contributes 91% of the total flux and has a 1/e diameter of 0.90 minutes. The tapered shape of this component is consistent with a $1/r$ squared dust density dependence. The compact component is unresolved (less than 0.2 minutes in diameter) and represents emission from the central star seen through the circumstellar envelope. Author

N79-16751# Illinois Univ. at Urbana-Champaign, Urbana.
CHEMICAL MECHANISMS OF CHEMI- AND BIOLUMINESCENCE. REACTIONS OF HIGH ENERGY CONTENT ORGANIC COMPOUNDS
Brian K. Dixon, Peter Dover, Steven P. Sloane, and J. P. Smith 17 Jul. 1978 38 p
(Contract N00014-76-C-0745)
(AD-A056590) Avail: NTIS HC A03/MF A01 CSCL 07/3

The chemistry of high energy content molecules was investigated. In particular, the mechanisms by which these compounds rearrange to generate electronically excited states was probed. A new mechanism for chemiexcitation involving chemically initiated electron transfer was discovered. It was shown that this mechanism is applicable to many chemi and bioluminescent processes. Author (GRA)

N79-16752# European Space Agency, Paris (France).
SUPPLEMENT TO THE ULTRAVIOLET BRIGHT-STAR SPECTROPHOTOMETRIC CATALOGUE. A COMPILATION OF ABSOLUTE SPECTROPHOTOMETRIC DATA OBTAINED WITH THE SKY SURVEY TELESCOPE (S2/68) ON THE EUROPEAN ASTRONOMICAL SATELLITE TD-1
D. Macau-Hercot (Inst. d'Astrophys. de Liege), C. Jamar (Inst. d'Astrophys. de Liege), A. Monfils (Inst. d'Astrophys. de Liege), G. I. Thompson (Roy. Obs., Edinburgh), L. Houziaux (Dept. d'Astrophys. de Mons), and R. Wilson (Univ. Coll., London) Oct. 1978 174 p
(ESA-SR-28) Avail: NTIS HC A08/MF A01

This supplement to the catalog (ESA SR-27, November 1976) contains data obtained during the second and third observation periods, which lasted from 19 February 1973 to 30 September 1973 and from 16 February 1974 to 6 May 1974. Although most of the stars listed in the catalog were seen again during the second and third observation periods, the spectra presented in this supplement are those of stars that were not seen during the first period. The data reduction and selection criteria remain unchanged, so the data presented in the supplement are directly comparable with those in the main catalog. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-16753 Cornell Univ., Ithaca, N. Y.
TIDAL DISSIPATION IN THE SOLAR SYSTEM AND THE POSSIBILITY OF TIDALLY-DRIVEN PLANETARY MAGNETIC DYNAMOS Ph.D. Thesis
Howard Curtis Houben 1978 140 p
Avail: Univ. Microfilms Order No. 7902333

A numerical technique is developed for solution of the inseparable linearized momentum equation for a rotating inviscid fluid. Several problems in planetary fluid dynamics are solved with the aid of this technique. The problem of tidally forced motion in the adiabatic interiors of the giant planets is solved for a simple polytropic model of these planets. The numerical solution of the inseparable free oscillation problem is also applied to the peculiar spherical shell geometry of the earth's fluid core. Classical methods are applied to the forced tidal and precessional oscillations of a planetary core in the presence of magnetic fields. Dissert. Abstr.

N79-16754 Arizona Univ., Tucson.
INFRA-RED OBSERVATIONS OF INTERSTELLAR MOLECULAR HYDROGEN Ph.D. Thesis
Thomas Nicholas Gautier, III 1978 117 p
Avail: Univ. Microfilms Order No. 7901724

A decision was made to pursue a general survey for new molecular hydrogen emission sources. The 1-0S(1) line of H2 was chosen for the survey. A wide field, narrow band, tunable monochromator and a matching indium antimonide infrared detector system were built for particular sensitivity to large, low surface brightness H2 emission sources. Thirty-three astronomical objects of several types were included in the H2 survey and four new H2 sources were discovered. Three of the new sources, Sharpless 140, W3(OH) and NGC 7538 (N)-OH, lie in regions of space similar to the region of the Orion H2 source and appear to be associated with active star formation. The fourth new source, LkH alpha 349, lies in a small isolated molecular cloud, not obviously a region of active star formation. The data on the four new sources are analyzed in terms of current shock heating models and ultraviolet fluorescence models. Dissert. Abstr.

N79-16755 California Univ., Santa Cruz.
THE STRUCTURE AND METALLICITY OF SO GALAXIES Ph.D. Thesis
David Burstein 1978 252 p
Avail: Univ. Microfilms Order No. 7900819

A subset of the 10 color system of Faber was used to measure absorption line strength (LS) and colors of five SO galaxies, two ellipticals and three globular clusters. These observations are combined with those of Faber and others in order to analyze the LS and color variations among old stellar populations. Two-dimensional photographic surface photometry is presented for 18 SO's and one elliptical, NGC 3379. Isophotal maps and major and minor axis profiles are given for these galaxies. The major axis luminosity profiles of 12 SO's are decomposed into an exponential disk and an R to the 1/4 power law bulge. Previous methods of determining the disk to bulge ratio of galaxies are critically examined and two methods are introduced. The light distribution perpendicular to the major axes of five edge-on SO's are presented. Dissert. Abstr.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N79-16756 Maryland Univ., College Park.
THE LUNAR SURFACE GRAVIMETER AND THE SEARCH FOR GRAVITATIONAL RADIATION Ph.D. Thesis
Russell Lawrence Tobias 1978 213 p
Avail: Univ. Microfilms Order No. 7900910

A search for gravitational radiation predicted by Einstein's general theory of relativity was made, using the Moon as an instrumented antenna. Data were analyzed from the Lunar Surface Gravimeter Experiment (LSG), part of the Apollo Lunar Surface Experiments Package (ALSEP) deployed on the Moon. Included is a brief introduction to the basic theory of gravitational radiation, prospective sources, and methods of detection. Details of the construction and chronology of the LSG are described, along with the algorithms for data processing. A history of the use of the Earth and the Moon as detectors of gravitational radiation is recounted, along with a review of the relevant literature. Comparisons are made between the Earth and the Moon as gravitational radiation detectors. Dissert. Abstr.

N79-16757*# National Aeronautics and Space Administration, Washington, D. C.

SECOND INTERNATIONAL COLLOQUIUM ON MARS: ABSTRACTS FOR A COLLOQUIUM
1979 97 p refs Colloq. held at Pasadena, Calif., 15-18 Jan. 1979
(NASA-CP-2072) Avail: NTIS HC A05/MF A01 CSCL 03B

Abstracts of 110 papers relating to investigations of the planet Mars and intended for consideration at the colloquium are presented. Entries are arranged alphabetically according to the author's name. A.R.H.

N79-16758*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE SATURN SYSTEM
Donald M. Hunten, ed. (Ariz. Univ., Tucson) and David Morrison, ed. Dec. 1978 423 p Workshop held at the Reston Intern. Conf. Ctr., Reston, Virginia, 9-11 Feb. 1978
(Contract NAS7-100)
(NASA-CP-2068) Avail: NTIS HC A18/MF A01 CSCL 03B

Mission planning for orbiter and entry probes of the Saturn system emphasizes scientific studies of Saturn, its satellites, its rings, and its magnetosphere. For individual titles, see N79-16759 through N79-16783.

N79-16759*# National Aeronautics and Space Administration, Washington, D. C. Planetary Div.
BACKGROUND OF THE SOP SUP 2
Richard A. Wallace *In* JPL The Saturn System Dec. 1978 p 3-6 (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Two areas of interest are elaborated: Saturn mission design history, and Saturn's place in NASA's program plans. The first area provides a view of how changing concepts and techniques can affect mission design and science return. The second puts Saturn in perspective with regard to its role in NASA's overall planetary program. G.G.

N79-16760*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Space Science Div.
ORIGIN AND EVOLUTION OF THE SATURN SYSTEM: OBSERVATIONAL CONSEQUENCES
James B. Pollack *In* JPL The Saturn System Dec. 1978 p 9-30 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

A number of important cosmogonic questions concerning the Saturn system can be addressed with a Saturn-orbiter-dual-probe spacecraft mission. These questions include: The origin of the Saturn system; the source of Saturn's excess luminosity; the mechanism by which the irregular satellites were captured; the influence of Saturn's early luminosity on the composition of its regular satellites; and the origin of the rings. The first two topics can be studied by measurements made from an entry probe into Saturn's atmosphere, while the remaining issues can be investigated by measurements conducted from an orbiter. Background information is provided on these five questions describing the critical experiments needed to help resolve them. G.G.

N79-16761*# Texas Univ., Austin.
SATURN'S ATMOSPHERE: RESULTS OF RECENT INVESTIGATIONS
Laurence Trafton *In* JPL The Saturn System Dec. 1978 p 31-52 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Saturn apparently has a high clear layer of H2 under which lies a comparable layer rich in dusty material. Beneath this is a thicker layer consisting mostly of H2 mixed with haze particles. An NH3 cloud deck probably lies below this layer. Evidence for seasonal variations is presented in the form of changes in the NH3, CH4 and H2 absorptions. Finally, the latest mixing ratios for the gaseous constituents are summarized. G.G.

N79-16762*# Arizona Univ., Tucson. Steward Observatory.
THE THERMAL STRUCTURE OF SATURN: INFERENCES FROM GROUND-BASED AND AIRBORNE INFRARED OBSERVATIONS
Alan Tokunaga *In* JPL The Saturn System Dec. 1978 p 53-72 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Spectroscopic and photometric infrared observations of Saturn are reviewed and compared to the expected flux from thermal structure models. Large uncertainties exist in the far-infrared measurements, but the available data indicate that the effective temperature of the disk of Saturn is 90 + or - 5 K. The thermal structure models proposed by Tokunaga and Cess and by Gautier et al. (model 'N') agree best with the observations. North-South limb scans of Saturn at 10 and 20 micrometers show that the temperature inversion is much stronger at the South polar region than at the equator. Author

N79-16763*# California Univ., Berkeley. Space Science Division.
THE RINGS OF SATURN: STATE OF CURRENT KNOWLEDGE AND SOME SUGGESTIONS FOR FUTURE STUDIES
Jeffrey Cuzzi *In* JPL The Saturn System Dec. 1978 p 73-104 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The state of our current knowledge of the properties of the ring system as a whole, and of the particles individually, is assessed. Attention is primarily devoted to recent results and possibilities for exploration of the ring system by a Saturn orbiter. In particular, the infrared and microwave properties of the ring system are discussed. The behavior of the ring brightness is not well understood in the critical transition spectral region from approximately 100 micrometers to approximately 1 cm. Also, the dynamical behavior of the ring system is discussed. Recent theoretical studies show that ongoing dynamical effects continually affect the ring structure in azimuth (possibly producing the A ring brightness asymmetry) and in the vertical direction. Orbital spacecraft-based studies of the rings will offer several unique advantages and impact important cosmogonical questions. Bistatic radar studies and millimeter-wavelength spectrometer/radiometry will give particle sizes and composition limits needed to resolve the question of the density of the rings, and provide important boundary conditions on the state of Saturn's protoplanetary nebula near the time of planetary formation. G.G.

N79-16764*# Arizona Univ., Tucson. Dept. of Planetary Sciences and Lunar and Planetary Lab.
THE D AND E RINGS OF SATURN
Bradford A. Smith *In* JPL The Saturn System Dec. 1978 p 105-111 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

CCD observations of Saturn ring D, discovered by Guerin in 1969, confirm the existence of this inner ring and indicate that its surface brightness ranges from 0.03 (inner edge) to 0.05 (outer edge) relative to the maximum surface brightness of ring B. If ring D is composed of spherical, diffusely reflecting particles with average surface reflectivity equal to that of the particles in ring B, the average normal optical thickness of ring D is 0.02. Reanalysis of a photograph taken by Feibelman during the 1966 ring plane passage suggests a normal optical thickness for ring E between ~1 million and 10 to the minus 7 power, depending upon the average reflectivity of the particles. No new observations of this outer ring will be possible until the earth passes through the Saturn ring plane in 1979-80. Author

N79-16765*# State Univ. of New York at Stony Brook. Dept. of Mechanical Engineering and of Earth and Space Science.
LOW SURFACE PRESSURE MODELS FOR TITAN'S ATMOSPHERE
John Caldwell *In* JPL The Saturn System Dec. 1978 p 113-126 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The inversion model for the atmosphere of Titan is reviewed. The basic features of the model are: a cold surface (80 K), a warm stratosphere (160 K) and a low surface pressure (20 mbar). The model is consistent with all existing thermal infrared spectrophotometry, but it cannot preclude the existence of an opaque, cloud, thick atmosphere. The model excludes other gases than methane as bulk constituents. Radio wavelengths observations, including recent data from the very large array, are discussed. These long wavelength observations may be the only direct means of sampling the surface environment before an entry probe or flyby. G.G.

N79-16766*# Arizona Univ., Tucson. Dept. of Planetary Sciences and Lunar and Planetary Lab.

A TITAN ATMOSPHERE WITH A SURFACE TEMPERATURE OF 200K

Donald M. Hunten *In* JPL The Saturn System Dec. 1978 p 127-140 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 09B

The brightness temperature of Titan at 3 mm wavelength is around 200 K according to Ulich, Conklin, and Dickel (1978). Although an earlier measurement by Briggs is much colder, 200 K as the surface temperature was used to build an atmospheric model with a surface pressure of 21 bars. CH4 clouds form between 100 and 120 km altitude. The visual limb is near 200 km. The methane mixing ratio is 0.25 percent above the clouds and 7 percent below; the dominant gas is assumed to be N2. The thermal opacity is due to pressure-induced absorption in N2 and a trace (0.5 percent) of H2, with some help from cloud particles; unit opacity is reached at 600 mbar, 110 km from the surface. The radius of the solid body in this model is 2700 km, in reasonable agreement with 2600 km obtained if the density is the same as that of Ganymede and Callisto. G.G.

N79-16767*# Texas Univ. at Austin. Dept. of Astronomy.

TITAN'S ATMOSPHERE: COMMENTS ON HAZE CONTENT, METHANE ABUNDANCE, BAND SHAPES, AND HYDROGEN UPPER LIMIT

Laurence Trafton *In* JPL The Saturn System Dec. 1978 p 141-147 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The existence of scatterers in Titan's atmosphere was demonstrated in a paper published in the Astrophysical Journal three years ago. This conclusion was not affected by recent laboratory investigations showing that certain CH4 bands are independent of pressure because it was shown that the reflecting layer model failed to explain Titan's CH4 absorptions regardless on which portion of the curve of growth Titan's CH4 lines lie. Saturn's atmosphere was utilized along the central meridian for studies of CH4 absorption, and to show that the conclusion is insensitive to the moderate scattering there. The quite pronounced role of scattering in Titan's atmosphere strongly suggests that Titan's surface is obscured. G.G.

N79-16768*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Space Science Div.

PHYSICAL PROPERTIES OF AEROSOLS IN TITAN'S ATMOSPHERE AS DEDUCED FROM VISIBLE OBSERVATIONS

Kathy Rages and James B. Pollack *In* JPL The Saturn System Dec. 1978 p 149-160 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Analysis of the absolute value of Titan's albedo and its variation with increasing phase angle has yielded constraints on the optical properties and average particle size of the aerosols responsible for the scattering of visible light. The real index of refraction of the scattering material lies within the range 1.5 approximately less than nr approximately less than 2.0 and the average particle size is somewhere between 0.2 micrometer and 0.4 micrometer. The amount of limb darkening produced by these models leads to an occultation radius of approximately 2700 km. Author

N79-16769*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. Extraterrestrial Biology Div.

ORGANIC CHEMISTRY ON TITAN

Sherwood Chang, Thomas Scattergood, Sheldon Aronowitz, and Jose Flores *In* JPL The Saturn System Dec. 1978 p 181-184 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Observations of nonequilibrium phenomena on the Saturn satellite Titan indicate the occurrence of organic chemical evolution. Greenhouse and thermal inversion models of Titan's atmosphere provide environmental constraints within which various pathways for organic chemical synthesis are assessed. Experimental results and theoretical modeling studies suggest that the organic chemistry of the satellite may be dominated by two atmospheric processes: energetic-particle bombardment and photochemistry. Reactions initiated in various levels of the atmosphere by cosmic ray, Saturn wind, and solar wind particle bombardment of a CH4 - N2 atmospheric mixture can account for the C2-hydrocarbons, the UV-visible-absorbing stratospheric haze, and the reddish color of the satellite. Photochemical reactions of CH4 can also account for the presence of C2-hydrocarbons. In the lower Titan atmosphere, photochemical processes will be important if surface temperatures are sufficiently high for gaseous NH3 to exist. Hot H-atom reactions initiated by photo-dissociation of NH3 can couple the chemical reactions of NH3 and CH4 and produce organic matter. G.G.

N79-16770*# Naval Research Lab., Washington, D. C.

AERONOMY OF SATURN AND TITAN

Darrell F. Strobel *In* JPL The Saturn System Dec. 1978 p 185-194 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Saturn system presents exciting and unique objects for planetary aeronomy. The photochemistry of H2 and He leads to the formation of an ionosphere. Methane photolysis results in the formation of spectroscopically detectable amounts of C2H6 and C2H2 and in the case of Titan, C2H4. Density profiles of C2H6, C2H2, and PH3 should be indicative of the strength of atmospheric mixing processes. Author

N79-16771*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Earth and Space Sciences Div.

SATURN'S MICROWAVE SPECTRUM: IMPLICATIONS FOR THE ATMOSPHERE AND THE RINGS

M. J. Klein, M. A. Janssen, S. Gulkis, and E. T. Olsen *In* Its The Saturn System Dec. 1978 p 195-216 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Measurements of Saturn's disk temperature are compiled to determine the planet's microwave spectrum from 1 mm to 100 cm wavelength. The data were adjusted to conform with a common flux density scale. A model of Saturn's rings is used to remove the effects of the rings from the atmospheric component at centimeter and decimeter wavelengths. Theoretical spectra for a number of convective atmospheric models were computed and compared with the observed spectrum. Radiative-convective models with approximately solar composition and with an effective temperature of approximately 89 K are in good agreement with the observations. The agreement between the observed and theoretical spectra is a strong indication that gaseous ammonia is present in Saturn's atmosphere. A good fit to the data is obtained with an ammonia mixing ratio of approximately 5 x 10,0001. A comparison of the millimeter wavelength data with the best-fitting atmospheric spectrum indicates that the thermal component of the ring brightness temperature near 1 mm wavelength is approximately 25 k. G.G.

N79-16772*# Hawaii Univ., Honolulu. Inst. for Astronomy.

PHYSICAL PROPERTIES OF THE SATELLITES OF SATURN

Dale P. Cruikshank *In* JPL The Saturn System Dec. 1978 p 217-250 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The photometric and bulk parameters of the known and suspected satellites of Saturn are presented in updated tables and are compared. The surface compositions of all the satellites are discussed in terms of modern photometry and spectroscopy; most if not all of the inner bodies have water frost surfaces, but the outer three satellites have surfaces of unknown composition. The few reliable mass values of some inner satellites, together with the best current values for the satellite radii, suggest mean densities representative of bulk compositions dominated by frozen volatiles, though Titan may have a substantial volume fraction of silicates. The special case of Iapetus is considered in the light of new studies of its two distinct faces and polar cap. Author

N79-16773*# Colorado Univ., Boulder. Dept. of Astrogeophysics.

NON-THERMAL RADIO EMISSION FROM SATURN

James W. Warwick *In* JPL The Saturn System Dec. 1978

p 251-263 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Direct, strong evidence for non-thermal radio emission from Saturn exists in the hectometric data observed by Imp 6. The planet has been tentatively identified as a decametric source, but the most sensitive and most recent data fail to confirm this. At metric or decimetric wavelengths Saturn has no non-thermal emission like Jupiter's synchrotron sources. Finally, a comparative study of Earth and Jupiter radio emissions suggests lightning discharges. G.G.

N79-16774*# California Univ., Los Angeles. Dept. of Atmospheric Sciences.
MAGNETOSPHERE OF SATURN
George L. Siscoe *In* JPL The Saturn System Dec. 1978 p 265-284 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Models of the Saturnian magnetosphere based on the application of magnetospheric scaling relations to a spin-aligned planetary magnetic dipole, that produces a surface equatorial field strength in the range 0.5 to 2 gauss, exhibit the following properties: (1) The orbit of Titan lies inside of the magnetosphere essentially all of the time, even when variations in the size of the magnetosphere resulting from solar wind pressure changes are taken into account; (2) the Brice-type planetary plasmasphere reaches a peak density of about 10 protons cm/3 at L approximately 7 (L = planetocentric distance in units of planetary radii); (3) Saturn's rings have a profound effect on the energetic particle population and the plasmaspheres derived from interstellar neutrals and Titan's torus; (4) the model calculation suggests that the Titan-derived plasmasphere may be self-amplifying with a feed-back factor greater than unity, which implies the possibility of a non-linearly saturated, highly inflated Saturnian magnetosphere; and (5) this same source can have important eroding effects on the outer edge of the rings determined by Brown-Lauzerotti sputtering rates. Author

N79-16775*# California Inst. of Tech., Pasadena.
VOYAGER INVESTIGATIONS OF THE SATURNIAN SYSTEM
E. C. Stone *In* JPL The Saturn System Dec. 1978 p 285-299 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

A brief review of the objectives and capabilities of the Voyager mission at Saturn is provided. In addition to a description of the eleven Voyager investigations and the Saturn encounter geometry, the scientific capabilities are discussed in the areas of atmospheric, satellite, magnetospheric, and ring studies. Author

N79-16776*# Arizona Univ., Tucson. Dept. of Planetary Sciences and Lunar and Planetary Lab.
VOYAGER IMAGING SCIENCE INVESTIGATIONS
Bradford A. Smith *In* JPL The Saturn System Dec. 1978 p 301-308 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Voyager imaging science experiment objectives at Saturn include exploratory reconnaissance of Saturn, its satellites and its rings. The imaging cameras are described, along with an abbreviated discussion of specific objectives. Author

N79-16777*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Extraterrestrial Physics Lab.
WHAT THE VOYAGER INFRARED INVESTIGATORS HOPE TO LEARN ABOUT THE SATURN SYSTEM
R. A. Hanel *In* JPL The Saturn System Dec. 1978 p 309-316 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Voyager infrared investigation uses a Michelson interferometer (IRIS) covering the spectral range from 200 to 3000 cm/1 (3.3 to 50 micrometers) and a bore sighted radiometer covering the range from 5000 to 25000 cm/1 (0.4 to 2 micrometers). The spectral resolution of the interferometer is 4.3 cm/1 and the field of view is 0.25 deg. Scientific results anticipated from the investigation of the Saturnian system are discussed. G.G.

N79-16778*# Stanford Univ., Calif. Radioscience Lab.
VOYAGER RADIO OCCULTATION INVESTIGATIONS AT SATURN
G. L. Tyler and V. R. Eshleman *In* JPL The Saturn System Dec. 1978 p 317-330 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Voyager will use dual-frequency 3.5 and 13 cm wavelength radio occultation techniques to study the atmospheres and ionospheres of Saturn and Titan, and the rings of Saturn. At Titan radio occultation is predicted to probe the atmosphere to the surface. The existence of a surface could be confirmed by detection of an obliquely scattered echo. At Saturn the two Voyager encounters will provide occultation measurements of temperate and equatorial regions of the atmosphere and ionosphere, and of the rings. The atmosphere will also be probed in polar regions during the deepest portions of the occultation. Both frequency and intensity data will be collected and jointly analyzed to study temperature-pressure profiles, and to derive information on atmospheric shape, turbulence, and weather. For the rings, Voyager will provide measurements of the complex (amplitude and phase) radio extinction and angular scattering functions of the ring particles as a function of wavelength, polarization, and radial distance from Saturn. G.G.

N79-16779*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SATURN ORBITER DUAL PROBE MISSION
Richard P. Rudd *In* Its The Saturn System Dec. 1978 p 345-360 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The described Saturn orbiter dual probe mission and spacecraft combines three systems into a multi-purpose Saturn exploration package. The spacecraft consists of: (1) Saturn orbiter; (2) Saturn probe; and (3) Titan probe or lander. This single spacecraft provides the capability to conduct in situ measurements of the Saturn and Titan atmospheres, and, possibly the Titan surface, as well as a variety of remote sensing measurements. The remote sensing capabilities will be used to study the surfaces, interiors and environments of Saturn's satellites, the rings of Saturn, Saturn's magnetosphere, and synoptic properties of Saturn's atmosphere. G.G.

N79-16780*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OUTER PLANET PROBE MISSIONS, DESIGNS AND SCIENCE
Lawrence Colin *In* JPL The Saturn System Dec. 1978 p 361-378 (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The similarities and differences of atmosphere entry probe mission designs and sciences appropriate to certain solar system objects, are reviewed. Candidate payloads for Saturn and Titan probes are suggested. Significant supporting research and technology efforts are required to develop mission-peculiar technology for probe exploration of the Saturnian system. G.G.

N79-16781*# National Aeronautics and Space Administration, Washington, D. C.
GALILEO ORBITER SPACECRAFT AND INSTRUMENTATION
David Morrison *In* JPL The Saturn System Dec. 1978 p 379-384 ref (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Galileo Jupiter orbiter and its science investigations are briefly described as a baseline design for a Saturn orbiter. Author

N79-16782*# Centre National d'Etudes Spatiales, Paris (France).
A METHOD OF EXPLORATION OF THE ATMOSPHERE OF TITAN
Jacques Blamont *In* JPL The Saturn System Dec. 1978 p 385-393 refs (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

A hot-air balloon, with the air heated by natural sources, is described. Buoyancy is accomplished by either solar heating or by utilizing the IR thermal flux of the planet to heat the gas in the balloon. Altitude control is provided by a valve which is opened and closed by a barometer. The balloon is made of an

organic material which has to absorb radiant energy and to emit as little as possible. G.G.

N79-16783*# Arizona Univ., Tucson. Dept. of Planetary Science and Lunar and Planetary Lab.
CONCLUSIONS AND RECOMMENDATIONS: EXPLORATION OF THE SATURN SYSTEM
Donald M. Hunten *In* JPL The Saturn System Dec. 1978 p 407-420 (For primary document see N79-16758 07-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Saturn missions have the following principal goals, in order of importance: (1) Intensive investigation of the atmosphere of Saturn; (2) determination of regional surface chemistry and properties of the surface features of satellites and properties of ring particles; (3) intensive investigation of Titan; and (4) atmospheric dynamics and structure of Saturn satellites and Saturn rings. G.G.

N79-16784*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETIC FIELD OF MERCURY
N. F. Ness Jan. 1979 30 p refs Presented at Conf. on Origins of Planetary Magnetism, Houston, Tex., 8-11 Nov. 1978 (NASA-TM-79701) Avail: NTIS HC A03/MF A01 CSCL 03B

Data from Mariner 10 observations of Mercury indicate that there exists an intrinsic magnetic field of the planet, sufficiently strong at present to deflect the solar wind flow around the planet and to form a detached bow shock wave in the super Alfvenic solar wind. Four methods used to analyze the magnetic field data and derive quantitative values for the description of the planetary field include (1) comparison of bow shock and magnetopause relative positions at Mercury to those at Earth; (2) direct spherical harmonic analysis of the data; (3) modeling of the magnetosphere by an image dipole and infinite 2-D current sheet in addition to the planetary field; and (4) scaling of a mathematical model for the terrestrial magnetosphere. The results obtained yield dipole moments ranging from 2.4 to 5.1x10 to the 22d power, with the lower values associated cw cm with certain models using partial quadrupole and octupole terms to improve the least squares fitting of models to observations. A.R.H.

N79-16785*# Missouri Univ. -Rolla. Dept. of Chemistry.
TRANSPORT PROPERTIES IN THE ATMOSPHERE OF JUPITER Progress Report, Jan. 1977 - Dec. 1978
Louis Biolsi, Jr. Dec. 1978 91 p refs
(Grant NsG-1369)
(NASA-CR-158094) Avail: NTIS HC A05/MF A01 CSCL 03B

The calculation of transport properties near the surface of a probe entering the atmosphere of Jupiter is discussed for (1) transport properties in the pure Jovian atmosphere, (2) transport properties for collisions between monatomic carbon atoms, including the effect of excited electronic states, (3) transport properties at the boundaries for mixing of the pure Jovian atmosphere and the atmosphere due to the injection of gaseous ablation products, and (4) transport properties for interactions involving some of the molecular ablation products. The transport properties were calculated using the kinetic theory of gases. Transport collision integrals were calculated for only a limited set of empirical and semiempirical interaction potentials. Since the accuracy of the fit of these empirical potentials to the true potential usually determines the accuracy of the calculation of the transport properties, the various interaction potentials used in these calculations are discussed. F.O.S.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-16786 California Univ., Los Angeles.
THE INFLUENCE OF MEAN MOTION ON SOLAR SEMI-DIURNAL ATMOSPHERIC TIDES: A SPECTRAL APPROACH Ph.D. Thesis
Richard Leo Walterscheid 1978 223 p
Avail: Univ. Microfilms Order No. 7901414

Atmospheric oscillations with the period of half a solar day are thermally rather than gravitationally forced, and become an important component of air motion at thermospheric heights. A theory of solar semidiurnal atmospheric tides is presented in which mean-wind-related interactions are taken into account. Several numerical results of the theory are given for the solstitial seasons at which times such interactions are considered highly likely to be strongest because the wind fields attain their maximum strengths. The nonclassical tidal theory is more successful than the classical theory in predicting both the amplitude of the surface pressure oscillation and the altitude of the stratospheric phase several, associated with the solar semidiurnal tide and in predicting the prevalence of higher order tidal components in the wind and temperature oscillations of the lower thermosphere. Dissert. Abstr.

N79-16787 Indiana Univ., Bloomington.
MAIN-LINE HYDROXYL EMISSION FROM LONG-PERIOD VARIABLES Ph.D. Thesis
John Alan Kolena 1978 95 p
Avail: Univ. Microfilms Order No. 7900397

A search of 70 long-period and semiregular variables and 17 other infrared stars resulted in the detection of microwave OH emission in five of these objects. Each of these sources was found to have OH emission at both main-line frequencies (1665 and 1667 MHz). Upper detection limits to the main-line OH emission flux are given for all stars found not to be sources. Evidence is presented for the regular variation of the combined main-line flux as a function of the periodically varying stellar luminosity, thus indicating that the OH ground-state population is inverted by radiative rather than collisional means. Evidence is also presented for the periodic variation in the velocity of the edges of the circumstellar OH distribution. Several physical mechanisms are investigated in an attempt to explain the observed velocity variations. A model of the circumstellar OH velocity and spatial distribution is presented. Dissert. Abstr.

N79-16788 Missouri Univ., Rolla.
ATMOSPHERIC NEUTRON AND GAMMA RAY FLUXES AND ENERGY SPECTRA AT BALLOON ALTITUDE Ph.D. Thesis
Lwo Sheng Hsieh 1978 164 p
Avail: Univ. Microfilms Order No. 7824548

The energy spectra and fluxes of atmospheric neutrons and gamma-rays were measured with a time-of-flight (TOF) system using organic liquid scintillators, from two balloon flights at atmospheric depth of about 4.5 g/sq cm over Palestine, Texas (lambda = 42 degrees N). The detector consists of two banks of six NE213 liquid scintillators, each 7.6 cm x 7.6 cm. The two banks are separated by 75 cm with a TOF system between the two banks to measure upward or downward moving particles. Pulse shape discrimination is included on each NE213 scintillator to discriminate between neutrons and gamma-rays. This detector was calibrated at several neutron energies to determine the efficiency both as function of energy and direction of the incident neutrons. For gamma-rays, both the analytical and the Monte Carlo methods are used to calculate the efficiency. Dissert. Abstr.

N79-16010*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SOLAR WIND TURBULENCE EVENT DURING THE VOYAGER 1978 SOLAR CONJUNCTION PROFILED VIA NEW DSN RADIO SCIENCE
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1978 p 55-58 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 03B

N79-16011*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIAL AND SOLAR CYCLE VARIATIONS IN THE SOLAR WIND PHASE FLUCTUATION SPECTRAL INDEX AS DETERMINED FROM VOYAGER 1978 SOLAR CONJUNCTION DATA
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1978 p 59-65 refs (For primary document see N79-16000 07-12)
Avail: NTIS HC A07/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-16789*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HELIOS-2 VELA-ARIEL-5 GAMMA-RAY BURST SOURCE POSITION

T. L. Cline, J. H. Trainor, U. D. Desai, R. Klebesadel (Los Alamos Scientific Lab., N. Mex.), M. Ricketts (Leicester Univ., United Kingdom), and H. Heluken (Smithsonian Astrophysical Observatory, Cambridge, Mass.) Jan. 1979 18 p refs Submitted for publication

(NASA-TM-79697) Avail: NTIS HC A02/MF A01 CSCL 03B

The gamma-ray burst of 28 January 1976, one of 18 events thus far detected in interplanetary space with Helios-2, was also observed with the Vela-5A, -6A and the Ariel-5 satellites. A small source field is obtained from the intersection of the region derived from the observed time delays between Helios-2 and Vela-5A and -6A with the source region independently found with the Ariel-5 X-ray detector. This area contains neither any steady X-ray source as scanned by HEAO-A nor any previously catalogued X-ray, radio or infrared sources, X-ray transients, quasars, seyferts, globular clusters, flare stars, pulsars, white dwarfs or high energy gamma-ray sources. The region is however, within the source field of a gamma-ray transient observed in 1974, which exhibited nuclear gamma-ray line structure. Author

N79-16790*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TABULATED DATA FROM THE SAS-2 HIGH ENERGY GAMMA RAY TELESCOPE

C. E. Fichtel, R. C. Hartman, D. A. Kniffen, D. J. Thompson, H. B. Ogelman (Cukurova Univ., Adana, Turkey), T. Tumer, and M. E. Ozel (Middle East Technical Univ., Ankara, Turkey) Oct. 1978 105 p Submitted for publication

(NASA-TM-79650) Avail: NTIS HC A06/MF A01 CSCL 03B

The second small astronomy satellite (SAS-2) carried a high energy gamma ray telescope into an equitorial orbit with a 2 D inclination, an apogee of 610 km, and a perigee of 440 km. The energy threshold of the instrument was about 30 MeV, the energy of the gamma rays could be measured up to about 200 MeV, and the integral intensity above 200 MeV could also be measured. Summary tables of the gamma ray data are presented in two energy bands, 35-100 MeV and 100 MeV. The sky was divided into 144 solid angle elements, and, in each solid angle element for which data exist, the number of gamma rays observed is given and also the exposure factor. Information is provided to permit conversion of these data into approximate intensities. A.R.H.

N79-16791*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OPERATIONAL MODES FOR A WAVE INJECTION FACILITY ABOARD SPACELAB AND A SUB-SATELLITE

Peter L. Dyson Sep. 1978 44 p refs

(NASA-TM-79657) Avail: NTIS HC A03/MF A01 CSCL 03B

Various modes of operation are described for an orbiting wave injection facility planned to measure the properties of waves propagating in space plasma. Such a facility would cover a wide frequency range including MF and HF. Phase shift and Doppler shift measurements will yield more accurate measurements of echo time delay and the angle of arrival. Because Spacelab will involve some sub-satellites, some consideration is given to propagation between two vehicles both at HF and VHF. A.R.H.

99 GENERAL

N79-16792# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 55

29 Jan. 1979 77 p refs Transl. into ENGLISH from various Russian journals

(JPRS-72716) Copyright. Avail: NTIS HC A05/MF A01

Soviet news releases are presented on agrotechnology, industrial microbiology, instruments and equipment, plant pathology, and scientific organizations. Antiradiation suits for protection from superhigh frequencies were emphasized, along with informations sytems for medical data. For individual titles, see N79-16793 through N79-16794.

N79-16793# Joint Publications Research Service, Arlington, Va.

ANTIRADIATION SUIT AND OTHER SPECIAL CLOTHING AT INDUSTRIAL SAFETY EXHIBITION c54

D. Pipko *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 55 (JPRS-72716) 29 Jan. 1979 p 23-26 Transl. into ENGLISH from Sots. Industriya (Moscow), 7 Dec. 1978 p 4 (For primary document see N79-16792 07-99) Avail: NTIS HC A05/MF A01

An antiradiation suit is described; this suit protects the wearer from superhigh frequencies in electromagnetic fields. This protection was afforded by thin copper wire shielding mesh woven into the cotton fabric of the overalls and nittens. The helmet was metallic, and its face shield was made from transparent shielding material. Along with the antiradiation suit, suits for workers in ferrous metallurgy and glass production and suits for workers in medicinal preparations were featured. J.A.M.

N79-16794# Joint Publications Research Service, Arlington, Va.

BASIC DIRECTIONS IN RESEARCH ON THE PROBLEMS OF SCIENTIFIC MEDICAL INFORMATION c82

Yu. A. Shilinis *In its* Transl. on USSR Sci. and Technol.: Biomed. and Behavioral Sci., No. 55 (JPRS-72716) 29 Jan. 1979 p 41-48 Transl. into ENGLISH from Sov. Zdravookhr. (Moscow), no. 12, 1978 p 25-30 (For primary document see N79-16792 07-99)

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Information system for centralizing scientific medical information were examined. Various aspects of data processing were discussed, such as computer programs, information retrieval, data bases, etc. Further research into information services was recommended with an increased effectiveness of data to support scientific research and practical public health. J.A.M.

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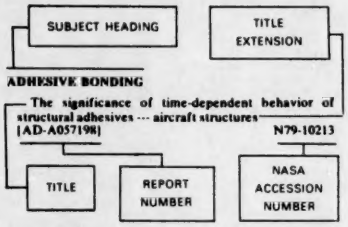
Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

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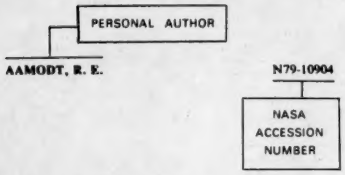

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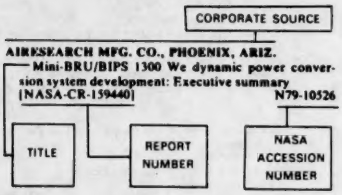

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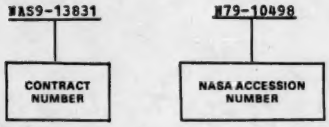

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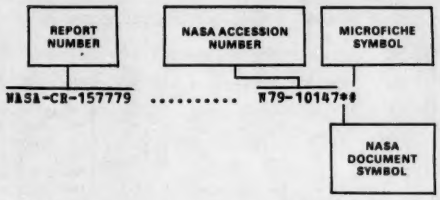

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